K 7
12/02

U.S. Environmental Protection Agency

Supplemental Site Investigations/ Site Characterization Report Himco Dump Superfund Site Elkhart, Indiana

Final

Volume 4 of 4
Appendix J - M

December 2002

Appendix J

Monitoring Well Construction Diagrams and Geologic Logs
Pre-1990 through 1995 Investigations

1-376

HIMCO Landfill

B1

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled: Elkhart   Civil Township: Cleveland

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc.   Twp. 38N R. 4E Sec. 36

About 1/2 Mi. W. of Nappannee St. on Co. Rd. 10 & about 1/2 Mi. N. of Rd. - W. Well

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner: U. S. Geological Survey   Address: 1819 N. Meridian, Indianapolis, Ind.

Building Contractor: ____   Address: ____

Name of Well Drilling Contractor: Ortman Drilling, Inc.

Address: 717 S. Malfalfa Road, Kokomo, Indiana

Name of Drilling Equipment Operator: Rick O., Lowell C., Dan E., Frank C.

WELL INFORMATION

Depth of well: 496   Date well was completed: Oct. 6, 1977

Diameter of casing or drive pipe: 5" PVC   Total Length: 490

Diameter of liner (if used): 4 5"   3' long   Total Length: .015 SS WW bottom screen

Diameter of Screen: 4 5"   Length: 3' long   Slot Size: .040 SS WW top screen

475 ft. to bottom of screen   495' to bottom of pipe

Type of Well: Drilled [X]   Gravel Pack [ ]   Driven [ ]   Other ____

Use of Well: For Home [ ] Test   For Industry [ ]   For Public Supply [ ]   Stock [ ]

Method of Drilling: Cable Tools [ ]   Rotary [X]   Rev. Rotary [ ]   Jet [ ]   Bucket Rig [ ]

Static water level in completed well (Distance from ground to water level) 6.5 feet

Bailer Test: Hours Tested ____ Rate ____ g.p.m. Drawdown ____ ft.

Pumping Test: Hours Tested Air Rate 60 g.p.m. Drawdown ____ ft.

(Drawdown is the difference between static level and water level at end of test)

Signature: Ortman Drilling, Inc. jg

Date: October 27, 1977

FOR WELL LOG SPACE USE REVERSE SIDE OF THIS SHEET

FOR ADMI[illegible]ATIVE USE ONLY LAT: 41 42 33 10/6/77
(Well [illegible] oes not fill o[illegible]) LONG: 86 0 36

COUNTY Elkhart TWP. 38N RGE. 4E NE ¼ NW ¼ NE SEC 36 Subdivision Name

Topo Map Osceola | 1800 Ft W of EL. | Ground Elevation 762'

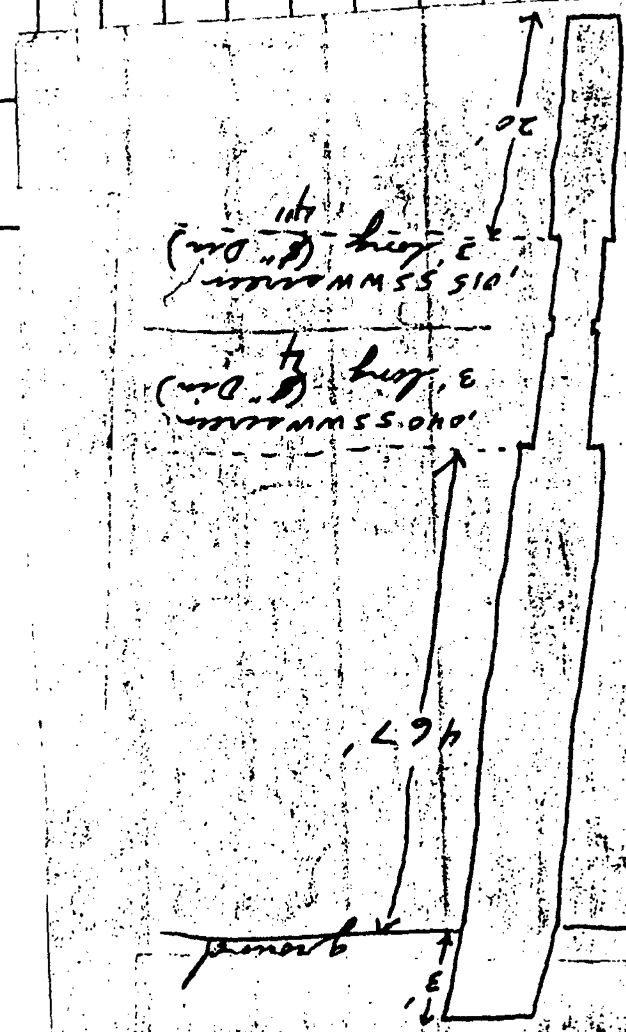
Field Located By U.S.G.S Date 10/6/77 | Ft N of SL. | Depth to bedrock 489

Courthouse Location By Date | Ft E of WL. | Bedrock elevation 273

Location accepted w/o verification by | 5 Ft S of NL. | Aquifer elevation | Lot Number

WATER WELL LOG

From	To	FORMATIONS (Color, type of material, hardness, etc.)
0	30	fine to med. sand & gravel
30	48	med. to coarse sand & gravel
48	160	fine to med. sand w/some gravel
160	240	fine to med. gravel w/some sand - finer at bottom
240	275	med. gravel w/some sand
275	300	fine to med. gravel w/sand
300	318	med. gravel w/some sand
318	375	fine to med. gravel
375	465	fine gravel & sand
465	475	med. gravel & broken stone
475	489	fine to med. gravel & broken stone
489	492	blue shale
492	496	brown siltstone
		16 hrs.
		NOTE: 18 jts. 200 PSI (20')
		6 jts. 160 PSI (20+)
		1 jt. 160 PSI plain end



HIMCO Landfill
B2

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled Elkhart Civil Township Cleveland

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc.

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner U.S.G.S. Address

Building Contractor U.S.G.S. Address

Name of Well Drilling Contractor: U.S.G.S.

...ss

Name of Drilling Equipment Operator: R. Duwelius & D. Black

WELL INFORMATION

De..h of well: 11.86' - Stick-up 1.80 Date well was completed: 11/3/77

Diameter . f casing or drive pipe: 2" Total Length: 1.86'

Diameter of liner (if used): Total Length:

Diameter of Screen: 2" Length: 10' Slot Size: 18

Type of Well: Drilled ☒ Gravel Pack ☐ Driven ☐ Other

Use of Well: For Home ☐ For Industry ☐ For Public Supply ☐ Stock ☐

Method of Drilling: Cable Tools ☐ Rotary ☐ Rev. Rotary ☐ Jet ☐ Bucket Rig ☐

Static water level in completed well (Distance from ground to water level) 8.15 feet

Bailer Test: Hours Tested ____ Rate ____ g.p.m. Drawdown ____ ft.

...ing Test: Hours Tested ____ Rate ____ g.p.m. Drawdown ____ ft.

(Drawdown is the difference between static level and water level at end of test)

Signature

Date

-2 Skimmer

FOR ADMINI[illegible]VE USE ONLY LAT 41°42'35" 1/12/93 11/3/[illegible]
(Well driller [illegible] not fill out) LONG 86° 0' 36" DAS

COUNTY Elkhart TWP. 38N RGE. [illegible] NE ¼ NW ¼ NE SEC 36 Subdivision Name

Topo Map Osceola

1800 Ft W of EL. Ground Elevation 762

Field Located By U.S.G.S. Date 11/3/77

Ft N of SL. Depth to bedrock

Courthouse Location By Date

Ft E of WL. Bedrock elevation

Location accepted w/o verification by

5 Ft S of NL. Aquifer elevation Lot Number

WATER WELL LOG

To	From	FORMATIONS (Color, type of material, hardness, etc.)
		W/L IN EAST WELL
		9.99 - 0.44 = 8.55 - STICK UP 2.20 6.75
		W/L IN CENTER WELL
		9.99 - 0.57 = 9.42 - STICK UP 3.14 = 6.28
		W/L IN WEST WELL
		9.99 - 1.53 = 8.46 - STICK UP 1.90 = 6.46
		SET 10' #10 SLOT SCREEN
		SURGED W/ WATER
		W/L 9.99 - 1.84 = 8.15
		TD = 11.66 + .20 = 11.86
		STICK UP = 1.80
		LOCATION: MIDWAY BETWEEN
		WEST & CENTER WELL

77 - 376

B-3

HIMCO Landfill

B3

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled: Elkhart Civil Township: Cleveland

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc. Twp. 38N R. 4E Sec. 36

About 1/2 Mi. W. of Nappanee St. on Co. Rd. 10 & about 1/2 Mi. N. of Rd. - Middle Well

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner: U. S. Geological Survey Address: 1819 N. Meridian, Indianapolis, Ind.

Building Contractor: ______ Address: ______

Name of Well Drilling Contractor: Ortman Drilling, Inc.

Address: 717 S. Malfalfa Road, Kokomo, Indiana

Name of Drilling Equipment Operator: Rick O., Frank G., Lowell C., Dan E.

WELL INFORMATION

Depth of well: 135 Date well was completed: Oct. 17, 1977

Diameter of casing or drive pipe: 5" PVC Total Length: 126

Diameter of liner (if used): ______ Total Length: ______

Diameter of Screen: 2" Length: 5' long ~~2-Screens 12' overall~~ Slot Size: .018 SS WW 128' to bottom of screen

Type of Well: Drilled [X] Gravel Pack [ ] Driven [ ] Other ______

Use of Well: For Home [ ] Test For Industry [ ] For Public Supply [ ] Stock [ ]

Method of Drilling: Cable Tools [ ] Rotary [X] Rev. Rotary [ ] Jet [ ] Bucket Rig [ ]

Static water level in completed well (Distance from ground to water level) 6 feet

Bailer Test: Hours Tested ______ Rate ______ g.p.m. Drawdown ______ ft.

Pumping Test: Hours Tested Air Rate 100 g.p.m. Drawdown ______ ft.

(Drawdown is the difference between static level and water level at end of test)

Signature: Ortman Drilling, Inc. [illegible]

Date: October 27, 1977

WATER WELL LOG

FORMATIONS (Color, type of material, hardness, etc.)	From	To
fine to med. sand & gravel	0	20
med. to coarse sand & gravel	20	40
fine sand w/some gravel	40	133
48' streaks of coarse gravel		
gray clay	133	135
2 hrs.		
NOTE: 1 jt. 200 PSI (20+)		
4 jts. 160 PSI (20+)		
1 jt. 160 PSI plain end		

FOR ADMINISTRATIVE USE ONLY (Well dr... does not fill out) LAT 41 42 35 LONG 86 0' 36"

COUNTY Elkhart

Topo Map Osceola

Field Located By U.S.G.S. Date 10/17/??

Courthouse Location By ______ Date ______

Location accepted w/o verification by ______

TWP. 38N RGE. 4E NE ¼ NW ¼ NE ¼ SEC 36

1800 Ft W of EL.

______ Ft N of SL.

______ Ft E of WL.

5 Ft S of NL.

Ground Elevation 762

Depth to bedrock ______

Bedrock elevation ______

Aquifer elevation ______

Subdivision Name ______

Lot Number ______

77 - 376

[redacted]

B-4

HIMCO Landfill
B4

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled: Elkhart Civil Township: Cleveland

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc. Twp. 38N R. 4E Sec. 36

About 1/2 Mi. W. of Nappanee St. on Co. Rd. & about 1/2 Mi.N of Rd. - E. Well

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner: U. S. Geological Survey Address: 1819 N. Meridian, Indianapolis, Ind.

Building Contractor: ______ Address: ______

Name of Well Drilling Contractor: Ortman Drilling, Inc.

Address: 717 S. Malfalfa Road, Kokomo, Indiana

Name of Drilling Equipment Operator: Rick O., Frank G., Lowell C., Dan E.

WELL INFORMATION

Depth of well: 175 Date well was completed: Oct. 7, 1977

Diameter of casing or drive pipe: 5" PVC Total Length: 168

Diameter of liner (if used): ______ Total Length: ______

Diameter of Screen: 2" Length: 5' long Slot Size: .030 SS WW

Type of Well: Drilled [X] Gravel Pack [ ] Driven [ ] Other: bottom of screen 173'

Use of Well: For Home [ ] Test For Industry [ ] For Public Supply [ ] Stock [ ]

Method of Drilling: Cable Tools [ ] Rotary [X] Rev. Rotary [ ] Jet [ ] Bucket Rig [ ]

Static water level in completed well (Distance from ground to water level): 6 feet

Bailer Test: Hours Tested ______ Rate ______ g.p.m. Drawdown ______ ft.

Pumping Test: Hours Tested Air Rate 60 g.p.m. Drawdown ______ ft.

(Drawdown is the difference between static level and water level at end of test)

Signature: Ortman Drilling, Inc.

Date: October 27, 1977

WATER WELL LOG

FORMATIONS (Color, type of material, hardness, etc.)	From	To
fine to med. sand & gravel	0	18
med. to coarse sand & gravel	18	40
fine to med. sand w/gravel	40	132
48' - streak of coarse gravel		
gray clay	132	136
fine to med. sand w/gravel	136	160
med. gravel w/sand	160	175
3 hrs.		
NOTE: 2 jts. 200 PSI (20')		
6 jts. 160 PSI (20+)		
11' 160 PSI		

FOR ADMI[illegible]VE USE ONLY
(Well dr[illegible] s not fill out)

LAT 41° 42' 35" 1/12/93 DNS
LONG 86° 0' 36"

COUNTY Elkhart 10/7/

Topo Map Osceola TWP. 38N RGE. 4E NE ¼ NW ¼ NE ¼ SEC 36 Subdivision Name

Field Located By U.S.G.S. Date 10/7/77 | 1800 Ft W of EL. | Ground Elevation 762

Courthouse Location By ___ Date ___ | Ft N of SL. | Depth to bedrock

| Ft E of WL. | Bedrock elevation

Location accepted w/o verification by ___ | 5 Ft S of NL. | Aquifer elevation | Lot Number

77 - 376

C-1

HIMCO Canal(?)

C1

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled Elkhart Civil Township Cleveland

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc. Twp. 38N R. 4E Sec. 36

About 1/2 Mi. W. of Nappanee St. on Co. Rd. 10 about 1/8 Mi. N. of Rd. - N. Well

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner U. S. Geological Survey Address 1819 N. Meridian, Indianapolis, Ind.

Building Contractor ______ Address ______

Name of Well Drilling Contractor: Ortman Drilling, Inc.

Address 717 S. Malfalfa Road, Kokomo, Indiana

Name of Drilling Equipment Operator: Rick O., Frank G., Lowell C., Dan E.

WELL INFORMATION

Depth of well: 355 Date well was completed: Oct. 4, 1977

Diameter of casing or drive pipe: 5" PVC Total Length: 337½

Diameter of liner (if used): ______ Total Length: ______

Diameter of Screen: 2" Length: 5' long Slot Size: .018 SS WW
340' to bottom of screen

Type of Well: Drilled [X] Gravel Pack [ ] Driven [ ] Other ______

Use of Well: For Home [ ] Test For Industry [ ] For Public Supply [ ] Stock [ ]

Method of Drilling: Cable Tools [ ] Rotary [X] Rev. Rotary [ ] Jet [ ] Bucket Rig [ ]

Static water level in completed well (Distance from ground to water level) 6.7 feet

Bailer Test: Hours Tested ______ Rate ______ g.p.m. Drawdown ______ ft.

Pumping Test: Hours Tested Air Rate 35 g.p.m. Drawdown ______ ft.

(Drawdown is the difference between static level and water level at end of test)

Signature Ortman Drilling, Inc. sj

Date October 27, 1977

FOR WELL LOG SPACE USE REVERSE SIDE OF THIS SHEET

FOR ADMI[illegible] ATIVE USE ONLY
(Well [illegible] does not fill o[illegible])

LONG: 86° 0' 50"

COUNTY Elkhart TWP. 38N RGE. 4E SE ¼ NE ¼ NW SEC. 36 Subdivision Name

Topo Map Osceola

Field Located By U.S.G.S. Date 10/4/77

Courthouse Location By ______ Date ______

Location accepted w/o verification by ______

______ Ft W of EL.

______ Ft N of SL.

2650 Ft E of WL.

1050 Ft S of NL.

Ground Elevation 759

Depth to bedrock ______

Bedrock elevation ______

Aquifer elevation ______

Lot Number ______

WATER WELL LOG

FORMATIONS (Color, type of material, hardness, etc.)	From	To
med. to coarse sand & gravel	0	55
fine to med. sand & fine gravel - very sandy	55	135
95 - 100 streaks of gray clay		
sand brown clay	135	143
med. sand w/some gravel	143	147
sandy brown clay	147	149
med. sand w/some gravel	149	151
sandy brown clay	151	153
sand & gravel	153	154
brown-gray clay	154	156
sand & gravel	156	159
brownish gray clay	159	160
sand & gravel	160	161
brownish gray clay	161	180
medium sand & gravel	180	195
fine to med. sand & gravel (sandy)	195	210
fine to med. sand & gravel (sandy) & some brownish gray clay mixed	210	228
brownish gray clay	228	230
fine to med. sand & some gravel	230	235
med. sand & gravel w/some broken shale	235	255
fine sand	255	305
fine to med. sand & fine gravel	305	343
fine sand	343	355
bottom of screen 340 ft.		
10 hrs.		
NOTE: 8 jts. 200 PSI (20)		
8 jts. 160 PSI (204) 1 ft. 160 PSI plain		

HIMCO Landfill
C2

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled Elkhart Civil Township Cleveland

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc.

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner U.S.G.S. Address

Building Contractor U.S.G.S. Address

Name of Well Drilling Contractor: U.S.G.S

Address

Name of Drilling Equipment Operator: R. Duwelius & D Black

WELL INFORMATION

Depth of well: 12.47' Stick up 1.35 Date well was completed: 11/3/77

Diameter of casing or drive pipe: 2" Total Length: 2.47'

Diameter of liner (if used): Total Length:

Diameter of Screen: 2" Length: 10' Slot Size: 18

Type of Well: Drilled ☒ Gravel Pack ☐ Driven ☐ Other

Use of Well: For Home ☐ For Industry ☐ For Public Supply ☐ Stock ☐

Method of Drilling: Cable Tools ☐ Rotary ☐ Rev. Rotary ☐ Jet ☐ Bucket Rig ☐

Static water level in completed well (Distance from ground to water level) 7.51 feet

Bailer Test: Hours Tested Rate g.p.m. Drawdown ft.

Pumping Test: Hours Tested Rate g.p.m. Drawdown ft.

(Drawdown is the difference between static level and water level at end of test)

Signature

Date

FOR WELL LOG SPACE USE REVERSE SIDE OF THIS SHEET

C-2 Skimmer

FOR ADMINIS[TRAT]IVE USE ONLY
(Well driller does not fill out)

11/3/77 LAT 41°42' [..]1/12/93
LONG 86°0'50" DAS

COUNTY Elkhart TWP. 38N RGE. 4E SE ¼ NE ¼ NW SEC 36 Subdivision Name

Topo Map Osceola

Field Located By U.S.G.S. Date 11/3/77

Courthouse Location By ______ Date ______

Location accepted w/o verification by ______

______ Ft W of EL.
______ Ft N of SL.
2650 Ft E of WL.
1050 Ft S of NL.

Ground Elevation 759
Depth to bedrock ______
Bedrock elevation ______
Aquifer elevation ______
Lot Number ______

WATER WELL LOG

To	From	FORMATIONS (Color, type of material, hardness, etc.)
		W/L IN SOUTH WELL
		9.99 - 1.08 = 8.91 - STICK UP 2.59 = 6.32
		W/L IN MIDDLE WELL
		8.99 - 1.58 = 7.41 - STICK UP 2.40 = 5.01
		W/L IN NORTH WELL
		7.99 - 1.19 = 6.81 - STICK UP 2.68 = 4.13
		SET 10' #18 SLOT SCREEN
		SURGED W/ WATER
		W/L 9.99 - 2.46 = 7.51
		TD = 12.27 + .20 = 12.47
		STICK UP = 1.35
		LOCATION = MIDWAY BETWEEN NORTH
		& CENTER WELL @ SITE C
		Pulled first go round 1/81
		DEST 12/14/83

77 - 376

C-3

Himco Landfill

C3

DIVISION OF WATER
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Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled: Elkhart   Civil Township: Cleveland

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc. Twp. 38N R. 4E Sec. 36

About 1/2 Mi. W. of Nappanee St. on Co. Rd. 10 & about 1/8 Mi. N. of Rd. - Middle Well

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner: U. S. Geological Survey   Address: 1819 N. Meridian, Indianapolis, Ind.

Building Contractor: ____   Address: ____

Name of Well Drilling Contractor: Ortman Drilling, Inc.

Address: 717 S. Malfalfa Road, Kokomo, Indiana

Name of Drilling Equipment Operator: Rick O., Frank G., Lowell C., Dan E.

WELL INFORMATION

Depth of well: 195   Date well was completed: Oct. 5, 1977

Diameter of casing or drive pipe: 5" PVC   Total Length: 192

Diameter of liner (if used): ____   Total Length: ____

Diameter of Screen: 2"   Length: 5' long   Slot Size: .030 SS WW
195' to bottom of screen

Type of Well: Drilled [X]   Gravel Pack [ ]   Driven [ ]   Other ____

Use of Well: For Home [ ] Test   For Industry [ ]   For Public Supply [ ]   Stock [ ]

Method of Drilling: Cable Tools [ ]   Rotary [X]   Rev. Rotary [ ]   Jet [ ]   Bucket Rig [ ]

Static water level in completed well (Distance from ground to water level) 4.5 feet

Bailer Test: Hours Tested ____ Rate ____ g.p.m. Drawdown ____ ft.

Pumping Test: Hours Tested Air Rate 100+ g.p.m. Drawdown ____ ft.

(Drawdown is the difference between static level and water level at end of test)

Signature: Ortman Drilling, Inc.

Date: October 27, 1977

FOR WELL LOG SPACE USE REVERSE SIDE OF THIS SHEET

FOR ADM[illegible]RATIVE USE ONLY
(We[illegible] does not fill[illegible])

LONG' 86° 0' 50" DAS

COUNTY Elkhart TWP. 38N RGE. 4E SE ¼ NE ¼ NW SEC 36 Subdivision Name

Topo Map Osceola	Ft W of EL.	Ground Elevation 759	
Field Located By U.S.G.S. Date 10/5/77	Ft N of SL.	Depth to bedrock	
Courthouse Location By Date	2650 Ft E of WL.	Bedrock elevation	
Location accepted w/o verification by	1050 Ft S of NL.	Aquifer elevation	Lot Number

WATER WELL LOG

From	To	FORMATIONS (Color, type of material, hardness, etc.)
0	4	fine to med. sand & gravel
4	58	med.to coarse gravel w/some sand
58	90	fine to med. sand w/some gravel
90	100	fine to med. sand w/streaks of gray clay
100	143	fine to med. sand w/some gravel
143	162	fine to med. sand & gravel w/clay streaks
162	181	brown clay
181	195	fine to med. sand & gravel
		3 hrs.
		NOTE: 5 jts. 200 PSI (20+)
		4 jts. 160 PSI (20+)
		12' 160 PSI

77 - 376

C-4

HIMCO Landfill

C4

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled: Elkhart Civil Township: Cleveland

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc.

Twp. 38N R. 4E Sec. 36

About 1/2 Mi. W. of Nappanee St. on Co. Rd. 10 about 1/8 Mi. N. of Rd. - S. Well

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner: U. S. Geological Survey Address: 1819 N. Meridian, Indianapolis, Ind.

Building Contractor: Address:

Name of Well Drilling Contractor: Ortman Drilling, Inc.

Address: 717 S. Malfalfa Road, Kokomo, Indiana

Name of Drilling Equipment Operator: Rick O., Frank G., Lowell C., Dan E.

WELL INFORMATION

Depth of well: 135 Date well was completed: Oct. 5, 1977

Diameter of casing or drive pipe: 5" PVC Total Length: 119

Diameter of liner (if used): Total Length:

Diameter of Screen: 2" Length: 5' long / 2 Screens 12' overall Slot Size: .018 SS WW / 127.5' to bottom of screen

Type of Well: Drilled [X] Gravel Pack [ ] Driven [ ] Other

Use of Well: For Home [ ] Test For Industry [ ] For Public Supply [ ] Stock [ ]

Method of Drilling: Cable Tools [ ] Rotary [X] Rev. Rotary [ ] Jet [ ] Bucket Rig [ ]

Static water level in completed well (Distance from ground to water level) 5.7 feet

Bailer Test: Hours Tested ____ Rate ____ g.p.m. Drawdown ____ ft.

Pumping Test: Hours Tested Air Rate 50 g.p.m. Drawdown ____ ft.

(Drawdown is the difference between static level and water level at end of test)

Signature: Ortman Drilling, Inc. sg

Date: October 27, 1977

WATER WELL LOG

FORMATIONS (Color, type of material, hardness, etc.)	From	To
fine to med. sand & gravel	0	12
med. to coarse sand & gravel	12	53
fine to med. sand w/some gravel (finer at bottom)	53	134
gray clay	134	135
2 hrs.		
NOTE: 2 jts. 200 PSI (20')		
3 jts. 160 PSI (20')		
1 jt. 160 PSI plain end		

FOR ADMINISTRATIVE USE ONLY
(Well driller do not fill out)

COUNTY Elkhart TWP. 38N RGE. 4E SE ¼ NE ¼ NW ¼ SEC 36 Subdivision Name

LAT: 41° 42' 25"
LONG: 86° 0' 50"
1/12/93 DAS

Topo Map Osceola

Ground Elevation 759

Field Located By U.S.G.S. Date 10/5/77

Ft W of EL.

Depth to bedrock

Courthouse Location By ______ Date ______

Ft N of SL.

2650 Ft E of WL.

Bedrock elevation

Location accepted w/o verification by ______

1050 Ft S of NL.

Aquifer elevation

Lot Number

#4 D-1
(?)mmcrl

MIMCO Landfill

D1

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled Elkhart Civil Township Cleveland

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc.

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner U.S.G.S. Address

Building Contractor U.S.G.S. Address

Name of Well Drilling Contractor: U.S.G.S.

Address

Name of Drilling Equipment Operator: R. Downe(?) & D. Black

WELL INFORMATION

Depth of well: 19.30' - Stick-up 1.0' Date well was completed: 10/13/7?

Diameter of casing or drive pipe: 2" Total Length: 9.30

Diameter of liner (if used): Total Length:

Diameter of Screen: 2" Length: 10' Slot Size: 18

Type of Well: Drilled ☐ Gravel Pack ☐ Driven ☐ Other

Use of Well: For Home ☐ For Industry ☐ For Public Supply ☐ Stock ☐

Method of Drilling: Cable Tools ☐ Rotary ☐ Rev. Rotary ☐ Jet ☐ Bucket Rig ☐

Static water level in completed well (Distance from ground to water level) 15.48 feet

Bailer Test: Hours Tested Rate g.p.m. Drawdown ft.

Pumping Test: Hours Tested Rate g.p.m. Drawdown ft.

(Drawdown is the difference between static level and water level at end of test)

Signature

Date

FOR WELL LOG SPACE USE REVERSE SIDE OF THIS SHEET

(D-1 Skimmer)

FOR ADMINISTRATIVE USE ONLY LAT 41 42 35 ... 10/13/77
(Well driller does not fill out) LONG 86 0' 16"

COUNTY Elkhart TWP. 38N RGE. 4E NE ¼ NE ¼ NE SEC 36 Subdivision Name

Topo Map Osceola

Field Located By U.S.G.S. Date 10/13/77

Courthouse Location By ________ Date ________

Location accepted w/o verification by ________

50 Ft W of EL.

________ Ft N of SL.

________ Ft E of WL.

50 Ft S of NL.

Ground Elevation 269

Depth to bedrock ________

Bedrock elevation ________

Aquifer elevation ________

Lot Number ________

WATER WELL LOG

From	To	FORMATIONS (Color, type of material, hardness, etc.)
0	14	Brown Medium Sand
14	19	Dark Brown Med. Sand with gravel
19	22	Brown Coarse Sand with Small gravel
22		Bottom of Hole

Installed 10' #18 slot Screen

W/L 18.99 - 3.43 15.56

TD 19.70 + .23 19.93

Pipe Sticks up 1.0'

Surged well to wash down screen

W/L 15.99 - 0.51 15.48

TD 19.07 + .23 19.30

.5 ft sand in bottom of screen

Location: 10' North of Northern 5" obseration well 15' west of Road

W/L in Shallow well D

W/L 16.99 - 2.16 = 14.83

57-376

HIMCO Landfill

D2

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

ELL LOCATION

(Fill in completely - Refer to instruction sheet)

ounty in which well was drilled: Elkhart Civil Township: Cleveland

iving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc. Twp. 38N R. 4E Sec. 36

About 1/2 Mi. N. of Co. Rd. 10 on Nappanee St. on W. sd. of rd.

AME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner: U. S. Geological Survey Address: 1819 N. Meridian, Indianapolis, Ind.

Building Contractor: Address:

me Well Drilling Contractor: Ortman Drilling, Inc.

ldress: 717 S. Malfalfa Road, Kokomo, Indiana

me of Drilling Equipment Operator: Rick O., Lowell C., Frank G., Dan E.

ELL INFORMATION

pt f well: 185 Date well was completed: Oct. 3, 1977

ameter of casing or drive pipe: 5" PVC Total Length: 171

ameter of liner (if used): Total Length:

ameter of Screen: 2" Length: 5' Slot Size: .018 SS WW

pe of Well: Drilled [X] Gravel Pack [ ] Driven [ ] Other: 174' to bottom of screen

of Well: For Home [ ] Test For Industry [ ] For Public Supply [ ] Stock [ ]

thod of Drilling: Cable Tools [ ] Rotary [X] Rev. Rotary [ ] Jet [ ] Bucket Rig [ ]

tic water level in completed well (Distance from ground to water level) 14 feet

ler Test: Hours Tested Rate g.p.m. Drawdown ft.

mping Test: Hours Tested Air Rate 75 g.p.m. Drawdown ft.

(Drawdown is the difference between static level and water level at end of test)

Signature: Ortman Drilling, Inc.

Date: October 27, 1977

WATER WELL LOG

FORMATIONS (Color, type of material, hardness, etc.)	From	To
fine brown sand & gravel	0	18
fine to med. gravel	18	49
gritty sandy gray clay	49	52
fine to med. sand & gravel ~~w/streaks of gray clay~~	52	168
med. sand & gravel w/sand	168	174
blue shale	174	185
(used polyphos on this well)		
. hrs.		
OTE: 2 jts. 200 PSI (20+)		
6 jts. 160 PSI (20+)		
11' 160 PSI		

D-2

FOR ADMINISTRATIVE USE ONLY
(Well driller does not fill out)

LAT 41°42'35" LONG 86°0'16" 1/12/93 DAS

10/3/77

COUNTY Elkhart TWP. 38N RGE. 4E NE ¼ NE ¼ NE ¼ SEC 36 Subdivision Name

Topo Map Osceola

Field Located By U.S.G.S. Date 10/3/77

Courthouse Location By _____ Date _____

Location accepted w/o verification by _____

50 Ft W of EL. Ground Elevation 769

_____ Ft N of SL. Depth to bedrock 174

_____ Ft E of WL. Bedrock elevation 595

50 Ft S of NL. Aquifer elevation _____

Lot Number _____

77 - 376

HIMCU Landfill

[redacted]

D-3

D3

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled: Elkhart Civil Township: Cleveland

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc. Twp. 38N R. 4E Sec. 36

About 1/2 Mi. N. of Co. Rd. 10 on Nappanee St. on W. sd. of road - S. Well

N E OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner: U. S. Geological Survey Address: 1819 N. Meridian, Indianapolis, Ind.

Building Contractor: ______ Address: ______

Name of Well Drilling Contractor: Ortman Drilling, Inc.

A ss: 717 S. Malfalfa Road, Kokomo, Indiana

Name of Drilling Equipment Operator: Rick O., Frank G., Lowell C., Dan E.

WELL INFORMATION

Depth of well: 90 Date well was completed: Oct. 3, 1977

Diameter of casing or drive pipe: 5" Total Length: 79½

Diameter of liner (if used): ______ Total Length: ______

Diameter of Screen: 2" Length: 5' long ~~2-Screens~~ 11'10" overall Slot Size: .018
88' to bottom of screen

Type of Well: Drilled [X] Gravel Pack [ ] Driven [ ] Other ______

Use of Well: For Home [ ] Test For Industry [ ] For Public Supply [ ] Stock [ ]

Method of Drilling: Cable Tools [ ] Rotary [X] Rev. Rotary [ ] Jet [ ] Bucket Rig [ ]

Static water level in completed well (Distance from ground to water level) 14 feet

Bailer Test: Hours Tested ______ Rate ______ g.p.m. Drawdown ______ ft.

P ping Test: Hours Tested Air Rate 90 g.p.m. Drawdown ______ ft.

(Drawdown is the difference between static level and water level at end of test)

Signature: Ortman Drilling, Inc.

Date: October 27, 1977

FOR WELL LOG SPACE USE REVERSE SIDE OF THIS SHEET

D-3

FOR ADMINISTRATIVE USE ONLY LAT: 41 42 35 10/3/77
(Well driller does not fill out) LONG: 86° 0' 16" 1/12/93 DAS

COUNTY Elkhart TWP. 38N RGE. 4E NE ¼ NE ¼ NE ¼ SEC 36 Subdivision Name

Topo Map Osceola

Field Located By U.S.G.S. Date 10/3/77

Courthouse Location By ______ Date ______

Location accepted w/o verification by ______

50 Ft W of EL.

Ft N of SL.

Ft E of WL.

50 Ft S of NL.

Ground Elevation 769

Depth to bedrock

Bedrock elevation

Aquifer elevation

Lot Number

WATER WELL LOG

From	To	FORMATIONS (Color, type of material, hardness, etc.)
0	50	sand & med. to coarse gravel
50	90	sand & fine gravel
		(hard peat at 60') Coal? DD.
		2 hrs.
		NOTE: 2 jts. 160 PSI (20+)
		1 jt. 160 PSI (20)
		1 jt. 160 PSI plain end

HIMCO LANDFIL
D 4

#D-4

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled: Elkhart Civil Township: Cleveland

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc.

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner: U.S.G.S. Address:

Building Contractor: U.S.G.S. Address:

Name of Well Drilling Contractor: U.S.G.S

Address:

Name of Drilling Equipment Operator: R. Southwood & A. Martin

WELL INFORMATION

Depth of well: 29.94 Date well was completed: 2/27/85

Diameter of casing or drive pipe: 2" Total Length: 26'

Diameter of liner (if used): Total Length: 3'

Diameter of Screen: 1 1/4" Length: 3' Slot Size: 50 gauze

Type of Well: Drilled ☒ Gravel Pack ☐ Driven ☐ Other

Use of Well: For Home ☐ For Industry ☐ For Public Supply ☐ Stock ☐

Method of Drilling: Cable Tools ☐ Rotary ☐ Rev. Rotary ☐ Jet ☐ Bucket Rig ☐

Static water level in completed well (Distance from ground to water level) 15.04' feet

Bailer Test: Hours Tested ___ Rate ___ g.p.m. Drawdown ___ ft.

Pumping Test: Hours Tested ___ Rate ___ g.p.m. Drawdown ___ ft.

(Drawdown is the difference between static level and water level at end of test)

Signature

Date

FOR WELL LOG SPACE USE REVERSE SIDE OF THIS SHEET

D'-4

WATER WELL LOG

FORMATIONS (Color, type of material, hardness, etc.)	From	To
Top Soil	0	3
Lt SAND	3	10
Dr Brn Soil	10	13
Gravel & Sand ~~wet~~	13	14
Sand & Gravel wet	14	32

ABANDONED

Casing / screen removed? Yes No

Well / hole sealed with ____________

Placement method ____________

Sealant amount ________ Date Sealed ________

Sealing performed by ____________

Title / Agency ____________

Remarks ____________

WELL PULLED & SEALED
1/28/81 - D. EARLY

50 gauze screen 3 feet long

W/L 19.00 - 3.96 = 15.04

T/D 29.54 + .4 = 29.94

Well set at ground level

27' West of centerline (white line) of western leg of Nappanee

15' " " edge of pavement " " "

42' north of post with ribbon

& paint. Markings on Nappanee point direction

FOR ADMINISTRATIVE USE ONLY
(Well driller does not fill out)

LAT: 41° 42' 35"
LONG: 86° 0' 16"
1/12/93 DAS

COUNTY Elkhart TWP. 38N RGE. 4E NE ¼ NE ¼ NE ¼ SEC 36 Subdivision Name

Topo Map Osceola 50 Ft W of EL. Ground Elevation 769 Lot Number

Field Located By U.S.G.S. Date 9/27/77 ____ Ft N of SL. Depth to bedrock ____

Courthouse Location By ____ Date ____ ____ Ft E of WL. Bedrock elevation ____

Location accepted w/o verification by ____ 50 Ft S of NL. Aquifer elevation ____

4/24/

77 - 376

[redacted]

E · Test Hole

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled: Elkhart Civil Township: Cleveland

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinct landmarks, etc.

Twp. 38N R. 4E Sec. 36

About 800' W. of Nappanee St. on N. side of Co. Rd. 10 - South Hole

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner: U. S. Geological Survey Address: 1819 N. Meridian, Indianapolis, Ind.

Building Contractor: Address:

Name of Well Drilling Contractor: Ortman Drilling, Inc.

Address: 717 S. Malfalfa Road, Kokomo, Indiana

Name of Drilling Equipment Operator: Rick C., Frank C., Lovell C., Dan E.

WELL INFORMATION

Depth of well: 315 Date well was completed: Oct. 10, 1977

Diameter of casing or drive pipe: none Total Length:

Diameter of liner (if used): Total Length:

Diameter of Screen: none Length: Slot Size:

Type of Well: Drilled [X] Gravel Pack [ ] Driven [ ] Other

Use of Well: For Home [ ] Test For Industry [ ] For Public Supply [ ] Stock [ ]

Method of Drilling: Cable Tools [ ] Rotary [X] Rev. Rotary [ ] Jet [ ] Bucket Rig [ ]

Static water level in completed well (Distance from ground to water level) none feet

Bailer Test: Hours Tested ____ Rate ____ g.p.m. Drawdown ____ ft.

Pumping Test: Hours Tested ____ Rate ____ g.p.m. Drawdown ____ ft.

(Drawdown is the difference between static level and water level at end of test)

Signature [illegible]

Date October 27, 1977

FOR WELL LOG SPACE USE REVERSE SIDE OF THIS SHEET

WATER WELL LOG

FORMATIONS (Color, type of material, hardness, etc.)	From	To
brown dirty sand	0	6
gray fine to med. sand w/some gravel	6	30
gray med. sand & gravel	30	82
gray clay	82	84
fine to med. sand & gravel	84	88
gray clay	88	89
fine to med. brown sand w/some gravel	89	165
sandy gray clay	165	167
gray fine to med. sand & gravel	167	176
gritty gray clay	176	195
fine to med. sand & gravel	195	197
gray clay	197	199
sand & gravel	199	202
gray clay	202	210
gray fine to med. sand & gravel	210	221
gray clay	221	233
fine to med. sand & gravel w/streaks of clay	233	253
granite boulder	253	255
gray clay	255	260
soft blue-gray clay	260	303
blue shale	303	315
4 hrs.		
NO WELL SET		

COUNTY Elkhart TWP. 38N RGE. 4E ¼ ¼ SEC.

Topo Map Osceola

Field Located By U.S.G.S. Date

Courthouse Location By Date

Location accepted w/o verification by

(driller does not fill out)

Ft W of EL.

Ft N of SL.

Ft E of WL.

Ft S of NL.

Subdivision Name

Ground Elevation 764

Depth to bedrock 303

Bedrock elevation 461

Aquifer elevation

Lot Number

77 - 376

E-1

USGS well E-1

EH-8

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled: Elkhart Civil Township: Cleveland

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc. Twp. 38N R. 4E Sec. 36

About 800' W. of Nappanee St. on N. sd. of Co. Rd. 10 - North Well

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner: U. S. Geological Survey Address: 1819 N. Meridian, Indianapolis, Ind.

Building Contractor: ______ Address: ______

Name of Well Drilling Contractor: Ortman Drilling, Inc.

Address: 717 S. Malfalfa Road, Kokomo, Indiana

Name of Drilling Equipment Operator: Rick O., Dan E., Frank G., Lowell C.

WELL INFORMATION

Depth of well: 82 Date well was completed: Oct. 11, 1977

Diameter of casing or drive pipe: 5" PVC Total Length: 71

Diameter of liner (if used): ______ Total Length: ______

Diameter of Screen: 2" Length: 5' long 2 Screens Slot Size: .018 SS WW 80 ft. to bottom of screen

Type of Well: Drilled [X] Gravel Pack [ ] Driven [ ] Other ______

Use of Well: For Home [ ] Test For Industry [ ] For Public Supply [ ] Stock [ ]

Method of Drilling: Cable Tools [ ] Rotary [X] Rev. Rotary [ ] Jet [ ] Bucket Rig [ ]

Static water level in completed well (Distance from ground to water level) 11 feet

Bailer Test: Hours Tested ______ Rate ______ g.p.m. Drawdown ______ ft.

Pumping Test: Hours Tested Air Rate 60 g.p.m. Drawdown ______ ft.

(Drawdown is the difference between static level and water level at end of test)

Signature: Ortman Drilling, Inc. [signature]

Date: October 26, 1977

FOR WELL LOG SPACE USE REVERSE SIDE OF THIS SHEET

E-1

WATER WELL LOG

FORMATIONS (Color, type of material, hardness, etc.)	From	To
brown dirty sand	0	6
gray fine to med. sand w/some gravel	6	27
gray med. sand & gravel	27	65
fine to med. sand & gravel (sandy)	65	80
soft gray clay	80	82
2 hrs.		
NOTE: 3 jts. 160 PSI (20+)		
11' 160 PSI		

FOR ADMINISTRATIVE USE ONLY
(Well driller does not fill out)

COUNTY Elkhart TWP. 38N RGE. 4E SW ¼ SE ¼ NE ¼ SEC 36 Subdivision Name ______

Topo Map Osceola 900 Ft W of EL. Ground Elevation 764

Field Located By U.S.G.S. Date 10/11/77 ______ Ft N of SL. Depth to bedrock ______

Courthouse Location By ______ Date ______ ______ Ft E of WL. Bedrock elevation ______

Location accepted w/o verification by ______ 1925 Ft S of NL. Aquifer elevation ______ Lot Number ______

MIRCO Landfill

E2

E2

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled Elkhart Civil Township Cleveland

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc.

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner U.S.G.S. Address

Building Contractor U.S.G.S Address

Name of Well Drilling Contractor: U.S.G.S.

Address

Name of Drilling Equipment Operator: R. Duwelius & D. Black

WELL INFORMATION

Depth of well: 17.41' Stick-up 1.38' Date well was completed: 11/3/77

Diameter of casing or drive pipe: 2" Total Length: 7.41'

Diameter of liner (if used): Total Length:

Diameter of Screen: 2" Length: 10' Slot Size: 18 (#40)

Type of Well: Drilled ☒ Gravel Pack ☐ Driven ☐ Other

Use of Well: For Home ☐ For Industry ☐ For Public Supply ☐ Stock ☐

Method of Drilling: Cable Tools ☐ Rotary ☐ Rev. Rotary ☐ Jet ☐ Bucket Rig ☐

Static water level in completed well (Distance from ground to water level) 11.91 feet

Bailer Test: Hours Tested Rate g.p.m. Drawdown ft.

Pumping Test: Hours Tested Rate g.p.m. Drawdown ft.

(Drawdown is the difference between static level and water level at end of test)

Signature

Date

FOR WELL LOG SPACE USE REVERSE SIDE OF THIS SHEET

E-2 Skimmer

FOR ADMINISTRATIVE USE ONLY
(Well driller does not fill out)

11/3/77 LAT 41 4 6" LONG: 86 0 23" 1/12 DA

COUNTY Elkhart	TWP. 38N	RGE. 4E	SW ¼ SE ¼ NE	SEC 36

Subdivision Name

Topo Map Osceola	900 Ft W of EL.	Ground Elevation 264
Field Located By U.S.G.S Date 11/3/77	Ft N of SL.	Depth to bedrock
Courthouse Location By Date	Ft E of WL.	Bedrock elevation
Location accepted w/o verification by	1925 Ft S of NL.	Aquifer elevation

Lot Number

WATER WELL LOG

To

From

FORMATIONS (Color, type of material, hardness, etc.)

W/L IN SHALLOW WELL

12.99 - 1.16 11.83

SET 10' #18 SLOT SCREEN

SURGED W/ WATER

W/L 12.99 - 1.08 = 11.91

TD = 17.21 + .20 = 17.41

STICK UP = 1.38

LOCATION BETWEEN 5" WELLS

CLOSER TO SOUTH WELL

MJ-376
E-3

HIMCO Landfill
E 3

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled: Elkhart Civil Township: Cleveland

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc. Twp. 38N R. 4E Sec. 36

About 800' W. of Nappanee St. on N. sd. of Co. Rd. 10 - middle hole - South Well

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner: U. S. Geological Survey Address: 1819 N. Meridian, Indianapolis, Ind.

Building Contractor: ______ Address: ______

Name of Well Drilling Contractor: Ortman Drilling, Inc.

Address: 717 S. Malfalfa Road, Kokomo, Indiana

Name of Drilling Equipment Operator: Frank G., Lowell C.

WELL INFORMATION

Depth of well: 175 Date well was completed: Oct. 11, 1977

Diameter of casing or drive pipe: 5" PVC Total Length: 171

Diameter of liner (if used): ______ Total Length: ______

Diameter of Screen: 2" Length: 5' long Slot Size: .030 SS WW

174' to bottom of screen

Type of Well: Drilled [X] Gravel Pack [ ] Driven [ ] Other ______

Use of Well: For Home [ ] Test For Industry [ ] For Public Supply [ ] Stock [ ]

Method of Drilling: Cable Tools [ ] Rotary [X] Rev. Rotary [ ] Jet [ ] Bucket Rig [ ]

Static water level in completed well (Distance from ground to water level) 12 feet

Bailer Test: Hours Tested ______ Rate ______ g.p.m. Drawdown ______ ft.

Pumping Test: Hours Tested Air Rate 30 g.p.m. Drawdown ______ ft.

(Drawdown is the difference between static level and water level at end of test)

Signature: Ortman Drilling, Inc.

Date: Oct. 27, 1977

FOR WELL LOG SPACE USE REVERSE SIDE OF THIS SHEET

FOR AD[illegible]RATIVE USE ONLY
(Wel[illegible] does not fill [illegible])

LAT: 41° 42' 16"
LONG: 86° 0' 23"
1/2/93
DAS

COUNTY Elkhart TWP. 38N RGE. 4E SW ¼ SE ¼ NE ¼ SEC 36

Subdivision Name

Topo Map Osceola

Field Located By U.S.G.S Date 10/11/77

Courthouse Location By ______ Date ______

Location accepted w/o verification by ______

900 Ft W of EL.
______ Ft N of SL.
______ Ft E of WL.
1975 Ft S of NL.

Ground Elevation 764
Depth to bedrock ______
Bedrock elevation ______
Aquifer elevation ______
Lot Number ______

WATER WELL LOG

To	From	FORMATIONS (Color, type of material, hardness, etc.)
6	0	brown dirty sand
23	6	sand
56	23	sand & med. to coarse gravel
80	56	sand & med. gravel
83	80	gray clay
164	83	sand & fine gravel
168	164	sandy gray clay
174	168	sand & med. gravel
175	174	sandy brown clay
		3 hrs.
		NOTE: 2 jts. 200 PSI (20+)
		6 jts. 160 PSI (20+)
		11' 160 PSI

HIMCO Landfill

F-1

F1

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled: Elkhart Civil Township: Osolo

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc.

Well cotoff 4' below LSD and plugged w/ bentonite slurry by LR Watson + RF Duwelius 3/19/91

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner: U.S.G.S. Address:

Building Contractor: U.S.G.S. Address:

Name of Well Drilling Contractor: U.S.G.S

Address:

Name of Drilling Equipment Operator: R Duwelius & D. Black

WELL INFORMATION

Depth of well: 31.50' Date well was completed: 10/13/77

Diameter of casing or drive pipe: 2" - PVC Total Length: 20.5'

Diameter of liner (if used): -- Total Length:

Diameter of Screen: 2" Length: 10 ft. Slot Size: 18 - S.S.

Type of Well: Drilled ☐ Gravel Pack ☐ Driven ☐ Other ______

Use of Well: For Home ☐ For Industry ☐ For Public Supply ☐ Stock ☐

Method of Drilling: Cable Tools ☐ Rotary ☐ Rev. Rotary ☐ Jet ☐ Bucket Rig ☐

Static water level in completed well (Distance from ground to water level) ______ feet

Bailer Test: Hours Tested ______ Rate ______ g.p.m. Drawdown ______ ft.

Pumping Test: Hours Tested ______ Rate ______ g.p.m. Drawdown ______ ft.

(Drawdown is the difference between static level and water level at end of test)

Signature ______

Date ______

Not a skimmer! 1 (Plastic : above

FOR ADMINIST[illegible]VE USE ONLY
(Well driller [illegible] not fill out)

LAT: 41° 42' 10"
[illegible]: 85° 59' 58"

COUNTY Elkhart TWP. 38N RGE. 5E SW ¼ SE ¼ NW SEC 31 Subdivision Name

Topo Map Elkhart

Field Located By U.S.G.S. Date 10/13/77

Courthouse Location By ______ Date ______

Location accepted w/o verification by ______

3620 Ft W of EL.

2700 Ft N of SL.

______ Ft E of WL.

______ Ft S of NL.

Ground Elevation 760

Depth to bedrock ______

Bedrock elevation ______

Aquifer elevation ______

Lot Number ______

WATER WELL LOG

FORMATIONS (Color, type of material, hardness, etc.)	From	To
BLACK SANDY TOP SOIL	0	1.5
FINE BROWN SILTY SAND	1.5	4
FINE - MED BROWN SAND	4	9
SAND w/ SMALL GRAVEL	9	37.5
CLAY	37.5	
Installed 10' - #18 slot screen		
Pipe sticks up a few inches		
TD = 31.50 + .23 = 31.73		

77 - 376

2

HIMCO Landfill

F2

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled Elkhart Civil Township Osolo

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc. Twp. 38N R. 5E Sec. 30

On N. sd. of Tr. Rt. 19 where Rd. starts to curve to S. W. Well

Well cut off 4' below LSD and plugged w/ bentonite slurry by LR Watson + RF Duwelius 3/19/91.

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner U. S. Geological Survey Address 1819 N. Meridian, Indianapolis, Ind.

Building Contractor Address

Name of Well Drilling Contractor: Ortman Drilling, Inc.

Address 717 S. Malfalfa Road, Kokomo, Indiana

Name of Drilling Equipment Operator: Rick O., Frank G., Lowell C., Dan E.

WELL INFORMATION

Depth of well: 156 Date well was completed: Oct. 12, 1977

Diameter of casing or drive pipe: 5" PVC Total Length: 150

Diameter of liner (if used): -- Total Length:

Diameter of Screen: 2" Length: 5' Slot Size: .030 SS WW 153' to bottom of screen

Type of Well: Drilled [X] Gravel Pack [ ] Driven [ ] Other

Use of Well: For Home [ ] Test For Industry [ ] For Public Supply [ ] Stock [ ]

Method of Drilling: Cable Tools [ ] Rotary [X] Rev. Rotary [ ] Jet [ ] Bucket Rig [ ]

Static water level in completed well (Distance from ground to water level) 14.8 feet

Bailer Test: Hours Tested Rate g.p.m. Drawdown ft.

Pumping Test: Hours Tested Air Rate 25 g.p.m. Drawdown ft.

(Drawdown is the difference between static level and water level at end of test)

Signature Ortman Drilling, Inc.

Date October 26, 1977

1-2

FOR ADMINI[illegible]ATIVE USE ON[illegible] (Well driller does not fill out)

LAT: 41° 42' 10" LONG: 85° 59' 52" DAS 1/26/93

10/11/77

COUNTY Elkhart	TWP. 38N RGE. 5E SW ¼ SE ¼ NW SEC. 31		Subdivision Name
Topo Map Elkhart	3600 Ft W of EL.	Ground Elevation 760	
Field Located By U.S.G.S. Date 10/11/77	[illegible] Ft N of SL.	Depth to bedrock	
Courthouse Location By ____ Date ____	____ Ft E of WL.	Bedrock elevation	
Location accepted w/o verification by ____	____ Ft S of NL.	Aquifer elevation	Lot Number

WATER WELL LOG

FORMATIONS (Color, type of material, hardness, etc.)	From	To
fine brown sand	0	10
fine to med. gray sand & gravel	10	23
gray clay	23	28
med. sand & gravel	28	37
gray clay	37	80
fine dirty sand	80	93
gray clay	93	100
fine dirty sand	100	130
soft gray clay	130	136
fine to med. sand & gravel w/some streaks of clay	136	154
gray clay	154	156
hrs.		
NOTE: 2 fts. 200 PSI (20+)		
5 fts. 160 PSI (20+)		
10' 160 PSI		

HIMCO Landfill
F3

F-3

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled: Elkhart Civil Township: Osolo

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc.

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner: U.S.G.S. Address:

Building Contractor: U.S.G.S. Address:

Name of Well Drilling Contractor: U.S.G.S.

Address:

Name of Drilling Equipment Operator: R. Duwelius & D. Block

WELL INFORMATION

Depth of well: 14.72' Stick-up 1.68' Date well was completed: 11/3/77

Diameter of casing or drive pipe: 2" Total Length: 4.72'

Diameter of liner (if used): Total Length:

Diameter of Screen: 2" Length: 10' Slot Size: 18 (#40)

Type of Well: Drilled [X] Gravel Pack [ ] Driven [ ] Other

Use of Well: For Home [ ] For Industry [ ] For Public Supply [ ] Stock [ ]

Method of Drilling: Cable Tools [ ] Rotary [ ] Rev. Rotary [ ] Jet [ ] Bucket Rig [ ]

Static water level in completed well (Distance from ground to water level) 11.18 feet

Bail Test: Hours Tested ____ Rate ____ g.p.m. Drawdown ____ ft.

Pumping Test: Hours Tested ____ Rate ____ g.p.m. Drawdown ____ ft.

(Drawdown is the difference between static level and water level at end of test)

Signature

Date

[illegible]-3 Skimmer

FOR ADMINIS[illegible]IVE USE ONL[illegible]
(Well driller does not fill out)

11/3/77

LAT 41° [illegible] 10"
Long 85°59'58"

COUNTY Elkhart TWP. 38N RGE. 5E SW ¼ SE ¼ NW SEC 31

Subdivision Name

Topo Map Elkhart

Field Located By U.S.G.S. Date 11/3/77

Courthouse Location By ______ Date ______

Location accepted w/o verification by ______

3600 Ft W of EL.

2700 Ft N of SL.

______ Ft E of WL.

______ Ft S of NL.

Ground Elevation 760

Depth to bedrock ______

Bedrock elevation ______

Aquifer elevation ______

Lot Number ______

WATER WELL LOG

To	
From	
FORMATIONS (Color, type of material, hardness, etc.)	W/L IN SHALLOW WELL 10.99 - 1.10 9.89 SET 10' #18 SLOT SCREEN SURGED W/ WATER W/L 11.99 - 0.81 = 11.18 TD 14.52 + .20 = 14.72 STICK UP 1.68' LOCATION: IN LINE & BETWEEN TWO 5" WELLS WELL PULLED & SEALED 1/28/81 - D. EARLY

HIMCO Landfill

F4

5-4

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled: Elkhart   Civil Township: Osolo

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc.

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner: U.S.G.S.   Address:

Building Contractor: U.S.G.S.   Address:

Name of Well Drilling Contractor: U.S.G.S.

Address:

Name of Drilling Equipment Operator: R. Sou

WELL INFORMATION

Depth of well: 24.15   Date well was completed: 9/28/77

Diameter of casing or drive pipe: 2"   Total Length: 21'

Diameter of liner (if used):   Total Length:

Diameter of Screen: 1 1/4"   Length: 30"   Slot Size: 18 (#40)

Type of Well: Drilled ☒   Gravel Pack ☐   Driven ☐   Other

Use of Well: For Home ☐   For Industry ☐   For Public Supply ☐   Stock ☐

Method of Drilling: Cable Tools ☐   Rotary ☐   Rev. Rotary ☐   Jet ☐   Bucket Rig ☐

Static water level in completed well (Distance from ground to water level) 9.67' feet

Bailer Test: Hours Tested ____ Rate ____ g.p.m. Drawdown ____ ft.

Pumping Test: Hours Tested ____ Rate ____ g.p.m. Drawdown ____ ft.

(Drawdown is the difference between static level and water level at end of test)

Signature

Date

FOR WELL LOG SPACE USE REVERSE SIDE OF THIS SHEET

F-4

FOR ADMINISTRATIVE USE ONLY
(Well driller does not fill out)

LAT 41° 42' 10"
LONG 85° 59' 58"
DAS 1/28/93

COUNTY Elkhart TWP. 38N RGE. 5E SW ¼ SE ¼ NW SEC 31 Subdivision Name

Topo Map Elkhart

Field Located By U.S.G.S. Date 9/28/77

Courthouse Location By ______ Date ______

Location accepted w/o verification by ______

3600 Ft W of EL.

2700 Ft N of SL.

______ Ft E of WL.

______ Ft S of NL.

Ground Elevation 760

Depth to bedrock ______

Bedrock elevation ______

Aquifer elevation ______

Lot Number ______

WATER WELL LOG

From	To	FORMATIONS (Color, type of material, hardness, etc.)
0	2	Top Soil / Sand
2	27	Med to ~~Coarse~~ Sand ~~&~~ Gr wet 7'

WELL PULLED + SEALED
1/28/81 - D. EARLY

18 5.0' - 3' Screen
~~W/L~~ 11.0 - 1.37 - 9.67
T.D - 23.75 + .4 = $\boxed{24.15}$

Pumped until clean
Set at ground level.
Well located 2' 3" west & 9"
south of "No Parking within 15' of
[illegible] sign"
16' 6" north from edge of pavement

77-376

-5

HIMCO Landfill

F5

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled: Elkhart Civil Township: Osolo

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc. Twp. 38N R. 5E Sec. ~~30~~ 31

On N. sd. of Tr. Rt. 19 where Rd. starts to curve to S. E. Well

Well cutoff 4' below LSD and plugged w/bentonite slurry by LRWatson + RF Dowelius 3/19/91.

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner: U. S. Geological Survey Address: 1819 N. Meridian, Indianapolis, Ind.

Building Contractor: Address:

Name of Well Drilling Contractor: Ortman Drilling, Inc.

Address: 717 S. Malfalfa Road, Kokomo, Indiana

Name of Drilling Equipment Operator: Rick O., Frank G., Lowell C., Dan E.

WELL INFORMATION

Depth of well: 225 Date well was completed: Oct. 11, 1977

Diameter of casing or drive pipe: 5" PVC Total Length: 186

Diameter of liner (if used): Total Length:

Diameter of Screen: 2" Length: 5' long ~~2 Screens 12'~~ overall Slot Size: .018 SS WW 195' to bottom of screen

Type of Well: Drilled [X] Gravel Pack [ ] Driven [ ] Other

Use of Well: For Home [ ] Test For Industry [ ] For Public Supply [ ] Stock [ ]

Method of Drilling: Cable Tools [ ] Rotary [X] Rev. Rotary [ ] Jet [ ] Bucket Rig [ ]

Static water level in completed well (Distance from ground to water level) 15.4 feet

Bailer Test: Hours Tested ____ Rate ____ g.p.m. Drawdown ____ ft.

Pumping Test: Hours Tested Air Rate 30 g.p.m. Drawdown ____ ft.

(Drawdown is the difference between static level and water level at end of test)

Signature: Ortman Drilling, Inc.

Date: October 26, 1977

FOR ADMI[...]RATIVE USE O[...] (Well driller does not fill out)

LAT: 41° 42' 10" DAS
LONG: 85° 59' 58" 1/28/93

COUNTY Elkhart TWP. 38N RGE. 5E SW ¼ SE ¼ NW SEC 31 Subdivision Name

Topo Map Elkhart

Field Located By U.S.G.S. Date 10/11/77

Courthouse Location By ______ Date ______

Location accepted w/o verification by ______

3600 Ft W of EL.

2900 Ft N of SL.

______ Ft E of WL.

______ Ft S of NL.

Ground Elevation 760

Depth to bedrock 220

Bedrock elevation 540

Aquifer elevation ______

Lot Number ______

WATER WELL LOG

To	From	FORMATIONS (Color, type of material, hardness, etc.)
10	0	fine brown sand
17	10	fine to med. gray sand
23	17	med. to coarse sand & gravel
30	23	soft gray clay
37	30	med. sand & gravel
77	37	gray clay
92	77	fine dirty sand
99	92	gray clay
137	99	fine dirty sand
156	137	fine to med. sand w/some gravel
212	156	gray clay w/streaks of sand & gravel
220	212	blue clay
225	220	blue shale
		8 hrs.
		NOTE: 4 jts. 200 (20+)
		5 jts. 160 (30+)
		6' 160

77 - 376

G-1

HIMCO Landfill

G 1

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled: Elkhart   Civil Township: Osolo

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc.   Twp. 38N R. 5E Sec. 31

N. of Bristol St. on Edwardsburg Ave. 1 Blk., th. W. about 150' on N. side   S. Well

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner: U. S. Geological Survey   Address: 1819 N. Meridian, Indianapolis, Ind.

Building Contractor: ______   Address: ______

Name of Well Drilling Contractor: Ortman Drilling, Inc.

Address: 717 S. Malfalfa Road, Kokomo, Indiana

Name of Drilling Equipment Operator: Rick O., Frank C., Lowell C., Dan E.

WELL INFORMATION

Depth of well: 55   Date well was completed: Oct. 17, 1977

Diameter of casing or drive pipe: 5" PVC   Total Length: 47

Diameter of liner (if used): ______   Total Length: ______

Diameter of Screen: 2"   Length: 5'   Slot Size: .018 SS WW

50' to bottom of screen

Type of Well: Drilled [X]   Gravel Pack [ ]   Driven [ ]   Other ______

Use of Well: For Home [ ] Test   For Industry [ ]   For Public Supply [ ]   Stock [ ]

Method of Drilling: Cable Tools [ ]   Rotary [X]   Rev. Rotary [ ]   Jet [ ]   Bucket Rig [ ]

Static water level in completed well (Distance from ground to water level) 10.9 feet

Bailer Test: Hours Tested ______ Rate ______ g.p.m. Drawdown ______ ft.

Pumping Test: Hours Tested Air Rate 50 g.p.m. Drawdown ______ ft.

(Drawdown is the difference between static level and water level at end of test)

Signature: Ortman Drilling, Inc.

Date: October 26, 1977

X G-(

FOR ADMINIST[illegible]IVE USE ONLY
(Well driller does not fill out)

LAT: 41° 42' 15" DAS
LONG: 85° 59' 30" 1/28/93

10/[illegible]

COUNTY Elkhart TWP. 38N RGE. 5E SE ¼ SW ¼ NE ¼ SEC 31 Subdivision Name

Topo Map Elkhart

Field Located By U.S.G.S. Date 10/19/77

Courthouse Location By ______ Date ______

Location accepted w/o verification by ______

1550 Ft W of EL.

______ Ft N of SL.

______ Ft E of WL.

2050 Ft S of NL.

Ground Elevation 262

Depth to bedrock ______

Bedrock elevation ______

Aquifer elevation ______

Lot Number ______

WATER WELL LOG

FORMATIONS (Color, type of material, hardness, etc.)	From	To
fine to med. sand & gravel	0	50
gray clay	50	55
2 hrs.		
NOTE: 2 jts. 160 PSI (20+)		
7' 160 PSI		

G-2

HIMCO Landfill
G2

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled: Elkhart Civil Township: Oslo

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc.

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner: U.S.G.S. Address:

Building Contractor: U.S.G.S. Address:

Name of Well Drilling Contractor: U.S.G.S.

Address:

Name of Drilling Equipment Operator: R. Duwelius & D. Black

WELL INFORMATION

Depth of well: 16.33 Stick up 1.5' Date well was completed: 11/2/77

Diameter of casing or drive pipe: 2" Total Length: 6.33'

Diameter of liner (if used): Total Length:

Diameter of Screen: 2" Length: 10' Slot Size: 18 (#40)

Type of Well: Drilled ☒ Gravel Pack ☐ Driven ☐ Other

Use of Well: For Home ☐ For Industry ☐ For Public Supply ☐ Stock ☐

Method of Drilling: Cable Tools ☐ Rotary ☐ Rev. Rotary ☐ Jet ☐ Bucket Rig ☐

Static water level in completed well (Distance from ground to water level) [illegible] feet

Bailer Test: Hours Tested Rate g.p.m. Drawdown ft. (Drawdown is the difference between static level and water level at end of test)

Pumping Test: Hours Tested Rate g.p.m. Drawdown ft.

Signature

Date

G2 Skimmer

FOR ADMINIS[illegible]IVE USE ONLY
(Well driller does not fill out)

LAT: 41°42'15"
LONG: 85°59'30"
11/2/77

COUNTY Elkhart TWP. 38N RGE. 5E SE ¼ SW ¼ NE SEC 31

Subdivision Name ______

Topo Map Elkhart

Field Located By U.S.G.S. Date 11/2/77

Courthouse Location By ______ Date ______

Location accepted w/o verification by ______

1550 Ft W of EL.

______ Ft N of SL.

______ Ft E of WL.

2050 Ft S of NL.

Ground Elevation 762

Depth to bedrock ______

Bedrock elevation ______

Aquifer elevation ______

Lot Number ______

WATER WELL LOG

From	To	FORMATIONS (Color, type of material, hardness, etc.)
12.46		SHALLOW WELL W/L 14.99 - 1.51 = 13.48 STICK UP 1.02 SET 10' #18 SLOT SCREEN SURGED W/ WATER W/L 13.99 - 0.98 = 13.01 TD = 16.13 + .20 16.33 STICK UP = 1.51 LOCATION - 1/2 WAY BETWEEN TWO 5" WELLS @ SITE G. WELL PULLED & SEALED 1/28/81 - D. EARLY

77-376
G-3

HIMCO Landfill
G3

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled: Elkhart   Civil Township: Osolo

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc. Twp. 38N R. 5E Sec. 31

N. of Bristol St. on Edwardsburg Ave. 1 Block, th. W. about 150' on N. sd. N. Well

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner: U. S. Geological Survey   Address: 1819 N. Meridian, Indianapolis, Ind.

Building Contractor: ______   Address: ______

Name of Well Drilling Contractor: Ortman Drilling, Inc.

Address: 717 S. Malfalfa Road, Kokomo, Indiana

Name of Drilling Equipment Operator: Rick O., Frank G., Lowell C., Dan E.

WELL INFORMATION

Depth of well: 224   Date well was completed: Oct. 17, 1977

Diameter of casing or drive pipe: 5" PVC   Total Length: 160

Diameter of liner (if used): ______   Total Length: ______

Diameter of Screen: 2"   Length: 5' long ~~2 Screens 12'~~ overall   Slot Size: .018 SS WW
169' to bottom of scre

Type of Well: Drilled [X]   Gravel Pack [ ]   Driven [ ]   Other ______

Use of Well: For Home [ ] Test   For Industry [ ]   For Public Supply [ ]   Stock [ ]

Method of Drilling: Cable Tools [ ]   Rotary [X]   Rev. Rotary [ ]   Jet [ ]   Bucket Rig [ ]

Static water level in completed well (Distance from ground to water level) 8.3 feet

Bailer Test: Hours Tested ______ Rate ______ g.p.m. Drawdown ______ ft.

Pumping Test: Hours Tested Air Rate 75 g.p.m. Drawdown ______ ft.

(Drawdown is the difference between static level and water level at end of test)

Signature: Ortman Drilling, Inc.

Date: October 26, 1977

FOR WELL LOG SPACE USE REVERSE SIDE OF THIS SHEET

FOR ADM[illegible]ATIVE USE ONLY LAT: 41°42'15" 1/28/93
(Wel[illegible]oes not fill[illegible]) LONG: 85°59'30"

COUNTY Elkhart TWP. 38N RGE. 5E SE ¼ SW ¼ NE SEC. 31 Subdivision Name

Topo Map Elkhart | 1500 Ft W of EL. | Ground Elevation 762

Field Located By U.S.G.S. Date 10/17/91 | Ft N of SL. | Depth to bedrock 216

Courthouse Location By ______ Date ______ | Ft E of WL. | Bedrock elevation 546

Location accepted w/o verification by ______ | 2050 Ft S of NL. | Aquifer elevation ______ Lot Number ______

WATER WELL LOG

From	To	FORMATIONS (Color, type of material, hardness, etc.)
0	56	fine to med. sand & gravel
56	63	gray clay
63	65	sand & gravel
65	68	gray clay
68	190	fine to med. sand w/some gravel
170	172	gray clay
180	181	gray clay
186	187	gray clay
190	202	soft pinkish brown clay
202	216	brownish gray clay
216	224	blue shale
		4 hrs.
		NOTE: 3 jts. 200 PSI (20+)
		4 jts. 160 PSI (20+)
		1 jt. 160 PSI plain end

77 - 376

I-1

HIMCO Landfill

I 1

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled Elkhart Civil Township Cleveland

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc. Twp. 38N R. 4E Sec. 36

1 Block N. of Mishawaka St. on Nappanee St., th. W. 1/2 Block on S. sd. W. Well

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner U. S. Geological Survey Address 1819 N. Meridian, Indianapolis, Ind.

Building Contractor Address

Name of Well Drilling Contractor: Ortman Drilling, Inc.

Address 717 S. Malfalfa Road, Kokomo, Indiana

Name of Drilling Equipment Operator: Frank C., Lowell C.

WELL INFORMATION

Depth of well: 195 Date well was completed: Oct. 13, 1977

Diameter of casing or drive pipe: 5" PVC Total Length: 163

Diameter of liner (if used): Total Length:

Diameter of Screen: 2" Length: 5' 2 Screens - 12' overall Slot Size: .030 SS WW 172' to bottom of scree

Type of Well: Drilled [X] Gravel Pack [ ] Driven [ ] Other

Use of Well: For Home [ ] Test For Industry [ ] For Public Supply [ ] Stock [ ]

Method of Drilling: Cable Tools [ ] Rotary [X] Rev. Rotary [ ] Jet [ ] Bucket Rig [ ]

Static water level in completed well (Distance from ground to water level) 9 feet

Bailer Test: Hours Tested Rate g.p.m. Drawdown ft.

Pumping Test: Hours Tested Air Rate 100 g.p.m. Drawdown ft.

(Drawdown is the difference between static level and water level at end of test)

Signature Ortman Drilling, Inc.

Date October 26, 1977

FOR WELL LOG SPACE USE REVERSE SIDE OF THIS SHEET

FOR ADM[illegible]TIVE USE ONLY
(Well [illegible]er does not fill o[illegible])

LAT 41 41 48 — LONG 86° [illegible]' 18" — 11/12/93 MAS

COUNTY Elkhart TWP. [illegible] N RGE. [illegible] SE ¼ SE ¼ SE SEC 36 Subdivision Name

Topo Map [illegible] — [illegible] Ft W of EL. — Ground Elevation 752

Field Located By U.S.G.S. Date 10/[illegible] — [illegible] Ft N of SL. — Depth to bedrock 193

Courthouse Location By ______ Date ______ — Ft E of WL. — Bedrock elevation 559

Location accepted w/o verification by ______ — Ft S of NL. — Aquifer elevation ______ Lot Number ______

WATER WELL LOG

From	To	FORMATIONS (Color, type of material, hardness, etc.)
0	6	sand
6	8	red sandy clay
8	26	sand & fine gravel
26	28	sandy gray clay
28	37	sand & med. to coarse gravel
37	124	sandy gray clay
124	174	fine to med. gravel
174	184	gritty brown clay
184	193	fine gravel
193	195	blue shale
		4 hrs.
		NOTE: 3 Jts. 200 PSI (20+)
		5 Jts. 160 PSI (20+)
		3' 160 PSI

HIMCO Landfill

I#2

2

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled Elkhart Civil Township Cleveland

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc.

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner U.S.G.S. Address

Building Contractor U.S.G.S. Address

Name of Well Drilling Contractor: U.S.G.S.

Address

Name of Drilling Equipment Operator: R. Duwelius & D. Black

WELL INFORMATION

Depth of well: 15.37' Stick-up 1.60' Date well was completed: 11/3/77

Diameter of casing or drive pipe: 2" Total Length: 5.37'

Diameter of liner (if used): Total Length:

Diameter of Screen: 2" Length: 10' Slot Size: 18 #40

Type of Well: Drilled ☒ Gravel Pack ☐ Driven ☐ Other

Use of Well: For Home ☐ For Industry ☐ For Public Supply ☐ Stock ☐

Method of Drilling: Cable Tools ☐ Rotary ☐ Rev. Rotary ☐ Jet ☐ Bucket Rig ☐

Static water level in completed well (Distance from ground to water level) feet

Bailer Test: Hours Tested Rate g.p.m. Drawdown ft.

Pumping Test: Hours Tested Rate g.p.m. Drawdown ft.

(Drawdown is the difference between static level and water level at end of test)

Signature

Date

FOR WELL LOG SPACE USE REVERSE SIDE OF THIS SHEET

I-2 SKIMMER

FOR ADMINISTRATIVE USE ONLY
(Well driller does not fill out)

LAT 41 41' 48   1/12/93
Long: 8[illegible]° 0' 19"   LAS   11/5[illegible]

COUNTY Elkhart	TWP. 38N RGE. 4E [illegible] ¼ SE ¼ SE SEC 36		Subdivision Name
Topo Map Osceola	350 Ft W of EL.	Ground Elevation 752	
Field Located By U.S.G.S. Date 11/3/71	475 Ft N of SL.	Depth to bedrock	
Courthouse Location By ______ Date ______	______ Ft E of WL.	Bedrock elevation	
Location accepted w/o verification by ______	______ Ft S of NL.	Aquifer elevation	Lot Number

WATER WELL LOG

To	From	FORMATIONS (Color, type of material, hardness, etc.)
		W/L in Shallow Well
		9.99-1.01 = 8.98
		Set 10' #18 slot Screen
		Surged with water
		W/L 12.39-1.29 = 11.10
		T.D. 15.17 + .20 = 15.37
		Stick up 1.60
		Location: in Line + Between two 5" wells

77 - 376

[redacted]

I-3

HIMCO Landfill

I 3

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled: Elkhart Civil Township: Cleveland

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc. Twp. 38N R. 4E Sec. 36

1 Block N. of Mishawaka St. on Nappanee St., th. W. 1/2 Block on S. side E. Well

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner: U. S. Geological Survey Address: 1819 N. Meridian, Indianapolis, Ind.

Building Contractor: Address:

Name of Well Drilling Contractor: Ortman Drilling, Inc.

Address: 717 S. Malfalfa Road, Kokomo, Indiana

Name of Drilling Equipment Operator: Rick O., Frank G., Lowell C., Dan E.

WELL INFORMATION

Depth of well: 40 Date well was completed: Oct. 13, 1977

Diameter of casing or drive pipe: 5" Total Length: 32

Diameter of liner (if used): Total Length:

Diameter of Screen: 2" Length: 5' Slot Size: .018 SS [redacted]
35' to bottom of screen

Type of Well: Drilled [X] Gravel Pack [ ] Driven [ ] Other

Use of Well: For Home [ ] Test For Industry [ ] For Public Supply [ ] Stock [ ]

Method of Drilling: Cable Tools [ ] Rotary [X] Rev. Rotary [ ] Jet [ ] Bucket Rig [ ]

Static water level in completed well (Distance from ground to water level) 9 feet

Bailer Test: Hours Tested ____ Rate ____ g.p.m. Drawdown ____ ft.

Pumping Test: Hours Tested Air Rate 75 g.p.m. Drawdown ____ ft.

(Drawdown is the difference between static level and water level at end of test)

Signature: Ortman Drilling, Inc.

Date: October 26, 1977

FOR WELL LOG SPACE USE REVERSE SIDE OF THIS SHEET

I-3

WATER WELL LOG

FORMATIONS (Color, type of material, hardness, etc.)	From	To
brown sand	0	6
sandy brown clay	6	8
fine to med. sand & gravel	8	18
med. to coarse sand & gravel	18	36
gray clay	36	40
1 hr.		
NOTE: 1 jt. 160 PSI (20+)		
12' 160 PSI		

FOR ADMINISTRATIVE USE ONLY
(Well driller does not fill out)

COUNTY Elkhart TWP. 38N RGE. 4E SE ¼ SE ¼ SE ¼ SEC. 36 Subdivision Name

Topo Map Osceola 350 Ft W of EL. Ground Elevation 752

Field Located By U.S.G.S. Date 10/13/77 475 Ft N of SL. Depth to bedrock

Courthouse Location By / Date Ft E of WL. Bedrock elevation

Location accepted w/o verification by Ft S of NL. Aquifer elevation Lot Number

10/13/77

HIMCO LANDFILL

I 4

I-4

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled Elkhart Civil Township Cleveland

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc.

WELL PULLED
1/22/81 D.E.

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner U.S.G.S. Address

Building Contractor U.S.G.S. Address

Name of Well Drilling Contractor: U.S.G.S.

Address

Name of Drilling Equipment Operator: R. Southwood & A. Martin Jr.

WELL INFORMATION

Depth of well: 24.15' Date well was completed: 9/28/77

Diameter of casing or drive pipe: 2" Total Length: 21'

Diameter of liner (if used): Total Length:

Diameter of Screen: 1 1/4" Length: 30" Slot Size: 18 slot (#40)

Type of Well: Drilled ☒ Gravel Pack ☐ Driven ☐ Other

Use of Well: For Home ☐ For Industry ☐ For Public Supply ☐ Stock ☐

Method of Drilling: Cable Tools ☐ Rotary ☐ Rev. Rotary ☐ Jet ☐ Bucket Rig ☐

Static water level in completed well (Distance from ground to water level) 9.75 feet

Bailer Test: Hours Tested Rate g.p.m. Drawdown ft.

Pumping Test: Hours Tested Rate g.p.m. Drawdown ft.

(Drawdown is the difference between static level and water level at end of test)

Signature

Date

FOR WELL LOG SPACE USE REVERSE SIDE OF THIS SHEET

"I "4

FOR ADMINISTRATIVE USE ONLY
(Well driller does not fill out)

LAT: 41° 41' 48" 1/12/93
LONG: 86° 0' 18" DAS

9/28/

COUNTY	Elkhart	TWP.	38 N	RGE.	4E	SE ¼ SE ¼ SE	SEC. 36

Subdivision Name

Topo Map Osceola	350 Ft W of EL.	Ground Elevation 752	
Field Located By U.S.G.S Date 9/28/77	475 Ft N of SL.	Depth to bedrock	
Courthouse Location By Date	Ft E of WL.	Bedrock elevation	
Location accepted w/o verification by	Ft S of NL.	Aquifer elevation	Lot Number

WATER WELL LOG

FORMATIONS (Color, type of material, hardness, etc.)	From	To
Topsoil Eart	0	1
Sand Fine	1	8
Sand Med to Coarse	8	15
Sand LF Grav	15	27

WELL PULLED 1/22/81 D.E.

Screen: 18 Slot : 30" Length
Pumped until clear

W/L — 11.00 - 1.25 = 9.75
T/D 23.75 + .40 = 24.15
Well set at ground level
Location 8' 6" north & 1' east
of marked chain link fence post

77 - 376

J-1

HIMCO Landfill

J1

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled: Elkhart Civil Township: Osolo

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc. Twp. 38N R. 5E Sec. 32

Southwest Corner of Oak St. & McNaughton St.

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner: U. S. Geological Survey Address: 1819 N. Meridian, Indianapolis, Ind.

Building Contractor: Address:

Name of Well Drilling Contractor: Ortman Drilling, Inc.

Address: 717 S. Malfalfa Road, Kokomo, Indiana

Name of Drilling Equipment Operator: Rick O., Frank G., Lowell C., Dan E.

WELL INFORMATION

Depth of well: 40 Date well was completed: Oct. 12, 1977

Diameter of casing or drive pipe: 5" PVC Total Length: 37

Diameter of liner (if used): Total Length:

Diameter of Screen: 2" Length: 5' Slot Size: .018 SS WW

Type of Well: Drilled [X] Gravel Pack [ ] Driven [ ] Other: 40' to bottom of screen

Use of Well: For Home [ ] Test For Industry [ ] For Public Supply [ ] Stock [ ]

Method of Drilling: Cable Tools [ ] Rotary [X] Rev. Rotary [ ] Jet [ ] Bucket Rig [ ]

Static water level in completed well (Distance from ground to water level) 10.7 feet

Bailer Test: Hours Tested Rate g.p.m. Drawdown ft.

Pumping Test: Hours Tested Air Rate 60 g.p.m. Drawdown ft.

(Drawdown is the difference between static level and water level at end of test)

Signature: Ortman Drilling, Inc.

Date: October 26, 1977

FOR WELL LOG SPACE USE REVERSE SIDE OF THIS SHEET

WATER WELL LOG

FORMATIONS (Color, type of material, hardness, etc.)	From	To
fine to med. sand w/some gravel	0	20
med. to coarse sand & gravel	20	40
2 hrs.		
NOTE: 1 jt. 160 PSI (20+)		
17' 160 PSI		

FOR ADMINISTRATIVE USE ONLY
(Well driller does not fill out)

LAT: 41° 41' 55"
LONG: 85° 59' 40"
DAS 1/28/93
10/12/77

COUNTY Elkhart TWP. 38N RGE. 5E NW ¼ SW ¼ SE ¼ SEC. 31

Topo Map Elkhart

Field Located By U.S.G.S. Date 10/12/77

Courthouse Location By ______ Date ______

Location accepted w/o verification by ______

2350 Ft W of EL.

1250 Ft N of SL.

______ Ft E of WL.

______ Ft S of NL.

Ground Elevation 754

Depth to bedrock ______

Bedrock elevation ______

Aquifer elevation ______

Subdivision Name ______

Lot Number ______

HIMCO Landfill

J2

J-2

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled Elkhart Civil Township Osolo

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc.

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner U.S.G.S. Address

Building Contractor U.S.G.S. Address

Name of Well Drilling Contractor: U.S.G.S.

Address

Name of Drilling Equipment Operator: R. Duwelius & D. Black

WELL INFORMATION

Depth of well: 12.76 stick-up 1.56' Date well was completed: 11/2/77

Diameter of casing or drive pipe: 2" Total Length: 7.76'

Diameter of liner (if used): Total Length:

Diameter of Screen: 2" Length: 10' Slot Size: 18 (#40)

Type of Well: Drilled ☐ Gravel Pack ☐ Driven ☐ Other

Use of Well: For Home ☐ For Industry ☐ For Public Supply ☐ Stock ☐

Method of Drilling: Cable Tools ☐ Rotary ☐ Rev. Rotary ☐ Jet ☐ Bucket Rig ☐

Static water level in completed well (Distance from ground to water level) 12.78 feet

Bailer Test: Hours Tested ____ Rate ____ g.p.m. Drawdown ____ ft.

Pumping Test: Hours Tested ____ Rate ____ g.p.m. Drawdown ____ ft.

(Drawdown is the difference between static level and water level at end of test)

Signature

Date

FOR WELL LOG SPACE USE REVERSE SIDE OF THIS SHEET

U-2 Kimmer

FOR ADMINISTRATIVE USE ONLY
(Well driller does not fill out)

11/2/77

LAT: 41° 41' 45"
LONG: 85° 59' 42"

COUNTY Elkhart TWP. 38N RGE. 5E NW ¼ SW ¼ SE SEC 31 Subdivision Name

Topo Map Elkhart

Field Located By U.S.G.S. Date 11/2/77

Courthouse Location By ______ Date ______

Location accepted w/o verification by ______

2350 Ft W of EL.

1250 Ft N of SL.

______ Ft E of WL.

______ Ft S of NL.

Ground Elevation 754

Depth to bedrock ______

Bedrock elevation ______

Aquifer elevation ______

Lot Number ______

WATER WELL LOG

To	From	FORMATIONS (Color, type of material, hardness, etc.)
		W/L IN SHALLOW WELL
		13.99 - 2.51 = 11.48
		Set 10' #18 Slot Screen
		Surged clean w/ water
		W/L = 13.99 - 1.21 = 12.78
		T.D = 17.56 + .20 = 17.76
		STICK UP = 1.56
		Location approx ½ way
		between Ortman's 5"
		observation wells

77-376

J-3

HIMCO Landfill

J3

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled Elkhart Civil Township Osolo ?

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc. Twp. 38N R. 5E Sec. ~~32~~ 31

Southwest Corner of Oak St. & McNaughton St.

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner U. S. Geological Survey Address 1819 N. Meridian, Indianapolis, Ind.

Building Contractor ______ Address ______

Name of Well Drilling Contractor: Ortman Drilling, Inc.

Address 717 S. Malfalfa Road, Kokomo, Indiana

Name of Drilling Equipment Operator: Rick O., Frank G., Lowell C., Dan E.

WELL INFORMATION

Depth of well: 175 Date well was completed: Oct. 12, 1977

Diameter of casing or drive pipe: 5" Total Length: 149

Diameter of liner (if used): ______ Total Length: ______

Diameter of Screen: 2" Length: 5' Slot Size: .040 SS WW

152' to bottom of screen

Type of Well: Drilled [X] Gravel Pack [ ] Driven [ ] Other ______

Use of Well: For Home [ ] Test For Industry [ ] For Public Supply [ ] Stock [ ]

Method of Drilling: Cable Tools [ ] Rotary [X] Rev. Rotary [ ] Jet [ ] Bucket Rig [ ]

Static water level in completed well (Distance from ground to water level) 13.9 feet

Bailer Test: Hours Tested ______ Rate ______ g.p.m. Drawdown ______ ft.

Pumping Test: Hours Tested Air Rate 20 g.p.m. Drawdown ______ ft.

(Drawdown is the difference between static level and water level at end of test)

Signature Ortman Drilling, Inc.

Date October 26, 1977

FOR WELL LOG SPACE USE REVERSE SIDE OF THIS SHEET

J-

FOR ADMINISTRATIVE USE ONLY
(Well driller does not fill out)

LAT: 41° 41' 55" DAS
LONG: 85° 59' 40" 1/28/93

10/12/77

COUNTY Elkhart TWP. 38N RGE. 5E NW¼ SW ¼ SE ¼ SEC 31

Subdivision Name ______

Topo Map Elkhart

Field Located By U.S.G.S. Date 10/12/77

Courthouse Location By ______ Date ______

Location accepted w/o verification by ______

2350 Ft W of EL.

1250 Ft N of SL.

______ Ft E of WL.

______ Ft S of NL.

Ground Elevation 754

Depth to bedrock 165

Bedrock elevation 589

Aquifer elevation ______

Lot Number ______

WATER WELL LOG

From	To	FORMATIONS (Color, type of material, hardness, etc.)
0	20	fine to med. sand w/some gravel
20	39	med. to coarse sand & gravel
39	110	gray clay
110	122	alternate layers of sand & gravel & clay
122	145	gray clay
145	155	med. sand & gravel (tight)
155	165	blue clay
165	175	blue shale
		3 hrs.
		NOTE: 2 jts. 200 PSI (20+)
		5 jts. 160 PSI (20+)
		9' 160 PSI

77 - 376

K-1

HIMCO Landfill

K1

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled: Elkhart Civil Township: Concord

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc.

Twp. 37N R. 5E Sec. 6

1 Block E. of Nappanee St. on Beardsley Ave., th. 1 Block S. on SW Corner N. Well

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner: U. S. Geological Survey Address: 1819 N. Meridian, Indianapolis, Ind.

Building Contractor: Address:

Name of Well Drilling Contractor: Ortman Drilling, Inc.

Address: 717 S. Malfalfa Road, Kokomo, Indiana

Name of Drilling Equipment Operator: Rick O., Frank G., Lowell C., Dan E.

WELL INFORMATION

Depth of well: 63 Date well was completed: Oct. 13, 1977

Diameter of casing or drive pipe: 5" PVC Total Length: 57

Diameter of liner (if used): Total Length:

Diameter of Screen: 2" Length: 5' Slot Size: .018 SS WW
60' to bottom of screen

Type of Well: Drilled [X] Gravel Pack [ ] Driven [ ] Other

Use of Well: For Home [ ] test For Industry [ ] For Public Supply [ ] Stock [ ]

Method of Drilling: Cable Tools [ ] Rotary [X] Rev. Rotary [ ] Jet [ ] Bucket Rig [ ]

Static water level in completed well (Distance from ground to water level) 8.2 feet

Bailer Test: Hours Tested ____ Rate ____ g.p.m. Drawdown ____ ft.

Pumping Test: Hours Tested Air Rate 60 g.p.m. Drawdown ____ ft.

(Drawdown is the difference between static level and water level at end of test)

Signature: Ortman Drilling, Inc. mj

Date: October 26, 1977

FOR WELL LOG SPACE USE REVERSE SIDE OF THIS SHEET

K-1

FOR ADMINISTRATIVE USE ONLY LAT: 41 41 25 [illegible] 10/[illegible]
(Well driller does not fill out) LONG: 86° 0' 3" DAS

COUNTY Elkhart TWP. 37N RGE. 5E SE ¼ SW ¼ NW SEC 6 Subdivision Name

Topo Map Osceola

Field Located By U.S.G.S Date 10/[illegible]

Courthouse Location By ______ Date ______

Location accepted w/o verification by ______

______ Ft W of EL.
______ Ft N of SL.
200 Ft E of WL.
1800 Ft S of NL.

Ground Elevation 744
Depth to bedrock ______
Bedrock elevation ______
Aquifer elevation ______
Lot Number ______

WATER WELL LOG

FORMATIONS (Color, type of material, hardness, etc.)	From	To
fine to med. sand & gravel	0	18
med. to coarse sand & gravel	18	45
fine to med. sand & gravel (sandy)	45	61
gray clay	61	63
2 hrs.		
NOTE: 2 jts. 160 PSI (20+)		
17' 160 PSI		

HIMCO Landfill

K2

Y-2

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled Elkhart Civil Township Concord

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc.

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner U.S.G.S. Address

Building Contractor USGS. Address

Name of Well Drilling Contractor: USGS.

Address

Name of Drilling Equipment Operator: R. Duwelius & D. Black

WELL INFORMATION

Depth of well: 14.65 Stick up - 0.49 Date well was completed: 11/2/??

Diameter of casing or drive pipe: 2" Total Length: 4.65'

Diameter of liner (if used): Total Length: 10'

Diameter of Screen: 2" Length: Slot Size: 18 (#?0)

Type of Well: Drilled ☒ Gravel Pack ☐ Driven ☐ Other

Use of Well: For Home ☐ For Industry ☐ For Public Supply ☐ Stock ☐

Method of Drilling: Cable Tools ☐ Rotary ☐ Rev. Rotary ☐ Jet ☐ Bucket Rig ☐

Static water level in completed well (Distance from ground to water level) 8.58 feet

Bailer Test: Hours Tested Rate g.p.m. Drawdown ft.

Pumping Test: Hours Tested Rate g.p.m. Drawdown ft.

(Drawdown is the difference between static level and water level at end of test)

Signature

Date

FOR WELL LOG SPACE USE REVERSE SIDE OF THIS SHEET

K-2 Skimmer

FOR ADMINISTRATIVE USE ONLY
(Well driller does not fill out)

11/2/77

LAT 41° 41' 5"
LONG 86° 0' 3"

1/12/93
CAS

COUNTY Elkhart TWP. 37N RGE. 5E SE ¼ SW ¼ NW SEC 6 Subdivision Name

Topo Map Osceola	Ft W of EL.	Ground Elevation 744		
Field Located By U.S.G.S. Date 11/2/77	Ft N of SL.	Depth to bedrock		
Courthouse Location By ______ Date ______	700 Ft E of WL.	Bedrock elevation		
Location accepted w/o verification by ______	1800 Ft S of NL.	Aquifer elevation	Lot Number	

WATER WELL LOG

To	From	FORMATIONS (Color, type of material, hardness, etc.)
		W/L IN NORTH WELL
		11.99 - 1.29 = 10.70 - 2.31 (STICK UP) = $\boxed{8.39}$
		W/L IN SOUTH WELL
		16.99 - 1.68 = 15.31 - 2.10 (STICK UP) 13.21
		SET 10' #18 SLOT SCREEN
		SURGED CLEAN W/ WATER
		W/L 9.99 - 1.41 8.58
		TD = 14.45 + .20 14.65
		STICK UP = 0.49
		Location: approx ½ way between 'ortmans 5" observation wells

77-376

K-3

HIMCO Landfill

K3

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION (Fill in completely - Refer to instruction sheet)

County in which well was drilled: Elkhart   Civil Township: Concord

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc.   Twp. 37N R. 5E Sec. 6

1 Block E. of Nappanee St. on Beardsley Ave., th. 1 Block S. on SW Corner S. Well

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner: U. S. Geological Survey   Address: 1819 N. Meridian, Indianapolis, Ind.

Building Contractor: ______   Address: ______

Name of Well Drilling Contractor: Ortman Drilling, Inc.

Address: 717 S. Malfalfa Road, Kokomo, Indiana

Name of Drilling Equipment Operator: Rick O., Frank G., Lowell C., Dan E.

WELL INFORMATION

Depth of well: 198   Date well was completed: Oct. 13, 1977

Diameter of casing or drive pipe: 5" PVC   Total Length: 180

Diameter of liner (if used): ______   Total Length: ______

Diameter of Screen: 2"   Length: 5'   Slot Size: .040 SS WW

Type of Well: Drilled [X]   Gravel Pack [ ]   Driven [ ]   Other: 183' to bottom of screen

Use of Well: For Home [ ] Test   For Industry [ ]   For Public Supply [ ]   Stock [ ]

Method of Drilling: Cable Tools [ ]   Rotary [X]   Rev. Rotary [ ]   Jet [ ]   Bucket Rig [ ]

Static water level in completed well (Distance from ground to water level) 15 feet

Bailer Test: Hours Tested ______ Rate ______ g.p.m. Drawdown ______ ft.

Pump Test: Hours Tested Air Rate 75 g.p.m. Drawdown ______ ft.

(Drawdown is the difference between static level and water level at end of test)

Signature: Ortman Drilling, Inc.

Date: October 26, 1977

K-3

FOR ADMINISTRATIVE USE ONLY LAT 41° 41' 25" 1/12/93 10/13/77
(Well driller does not fill out) LONG 86° 0' 3" DAS

COUNTY Elkhart TWP. 37N RGE. 5E SE ¼ SW ¼ NW ¼ SEC 6 Subdivision Name

Topo Map Osceola	______ Ft W of EL.	Ground Elevation ~~744~~ 748	
Field Located By U.S.G.S Date 10/13/77	______ Ft N of SL.	Depth to bedrock 194	
Courthouse Location By ______ Date ______	700 Ft E of WL.	Bedrock elevation 550	
Location accepted w/o verification by ______	1800 Ft S of NL.	Aquifer elevation ______	Lot Number ______

WATER WELL LOG

From	To	FORMATIONS (Color, type of material, hardness, etc.)
0	24	nd & fine gravel
24	59	med. to coarse sand & gravel
59	85	sandy gray clay
85	133	sandy fine to med. gravel
133	134	brown clay
134	135	fine to med. gravel
135	137	gray clay
137	171	sandy fine to med. gravel
171	173	gray clay
173	185	fine to med. gravel
185	193½	gritty gray clay
193½	194	sand & fine gravel
194	198	blue shale
		3 hrs.
		NOTE: 4 jts. 200 PSI (20+)
		7 jts. 160 PSI (20+)
		1 jt. 160 PSI plain end

M 1
SITE
M (1)

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled ELKHART Civil Township ____

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc.

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner USGS Address 1819 N MERIDIAN, INDPLS

Building Contractor — Address ____

Name of Well Drilling Contractor: SAME

Name of Drilling Equipment Operator: DUWELIUS / WATSON

WELL INFORMATION

Depth of well: 103.63 Date well was completed: 5/3/79

Diameter of casing or drive pipe: 2" GALV. Total Length: 98'

Diameter of liner (if used): — Total Length: ____

Diameter of Screen: 2" Length: 5' Slot Size: 18

Type of Well: Drilled ☒ Gravel Pack ☐ Driven ☐ Other ____

Use of Well: OBSERVATION For Home ☐ For Industry ☐ For Public Supply ☐ Stock ☐

Method of Drilling: AUGERS Cable Tools ☐ Rotary ☐ Rev. Rotary ☐ Jet ☐ Bucket Rig ☐

Static water level in completed well (Distance from ground to water level) ≈9 feet

Bailer Test: Hours Tested ____ Rate ____ g.p.m. Drawdown ____ ft.

Pumping Test: Hours Tested ____ Rate ____ g.p.m. Drawdown ____ ft.

(Drawdown is the difference between static level and water level at end of test)

Signature ____

Date ____

... USE REVERSE SIDE OF THIS SHEET

M(1) Del Well

FOR ADM[illegible]IVE USE ONLY
(Well driller does not fill out)

LAT 41° 42' 19"
LONG 86° 0' 24"

1/12/93
DAS

COUNTY: ELKHART TWP. 38N RGE. 4 E NW ¼ SE ¼ NE SEC. 36 Subdivision Name: ______

Topo Map: Osceola

Field Located By: USGS Date: 5/3/79

Courthouse Location By: ______ Date: ______

Location accepted w/o verification by: ______

900 Ft W of EL.

______ Ft N of SL.

______ Ft E of WL.

1700 Ft S of NL.

Ground Elevation: 767

Depth to bedrock: ______

Bedrock elevation: ______

Aquifer elevation: ______

Lot Number: ______

WATER WELL LOG

From	To	FORMATIONS (Color, type of material, hardness, etc.)
0	8	White Powder-like Fill
8	16	Grey Goo
16	25	Black Glop Trace of Sand
25	32	Drk Brown Fine Sand & Sm Gravel
32	43	Brown Sand & Sm-Med Gravel
43	105	Grey Fine Sand & Med Gravel
105		BTH
		Augers filled w/ Fine Sand
		Pushed #18 Screen + Galvanized
		Pipe in open hole to 103'
		Sealed w/ Bentonite
		TD = 95' - 8' Sand in well
		Could not develop w/ pump
		Used air compressor to develop
		well
		TD = 103.2 + 0.43 = 103.65
		W/L ≈ 9'

HIMCO Landfill
M2
SITE
M (2)

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled Elkhart Civil Township Cleveland

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc.

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner USGS Address 1819 N. Meridian,

Building Contractor Address Indpls Ind 46202

Name of Well Drilling Contractor: USGS

Address

Name of Drilling Equipment Operator: L.R. Watson

WELL INFORMATION

Depth of well: Date well was completed: 5-2-79

Diameter of casing or drive pipe: 2" PVC Total Length: 20'

Diameter of liner (if used): — Total Length: —

Diameter of Screen: 2" Length: 5' Slot Size: 18

Type of Well: Drilled ☒ Gravel Pack ☐ Driven ☐ Other

Use of Well: ~~For Home~~ ☐ OBSERVATION ~~For Industry~~ ☐ For Public Supply ☐ Stock ☐

Method of Drilling: Auger ~~Cable Tools~~ ☐ Rotary ☐ Rev. Rotary ☐ Jet ☐ Bucket Rig ☐

Static water level in completed well (Distance from ground to water level) feet

Bailer Test: Hours Tested Rate g.p.m. Drawdown ft.

Pumping Test: Hours Tested Rate g.p.m. Drawdown ft.

(Drawdown is the difference between static level and water level at end of test)

Signature Lee R. Watson

Date 5-2-79

FOR WELL LOG SPACE USE REVERSE SIDE OF THIS SHEET

WATER WELL LOG

FORMATIONS (Color, type of material, hardness, etc.)	From	To
Yellow-br sand	0	.5
White "Powdery" Fill	.5	7
Water Table ≃ 7'		
Dk grey soft wet stuff	7	
Terrible H_2S smell		15
Becoming sandy from 16		18
Black sandy runny stuff	18	
Terrible smell		30
From 30' Black fine grvl + runny	30	
From ≃ 43' include some hvy grvl		60
Med grvl - Black runny	60	73
Fine grvl - Grey runny	73	112
BTH 112'		
5' 18 slot SS screen w/ pt		
Pushed galv casing down to 86'		
Pulled back + sampled 4 Times		
Set pvc casing + 5' SS 18 slot screen		
Sealed w/ 2 (two) 50 lb bags		
Baroid Qwik-Gel		
Developed well, pumped ≃ 15 gpm		
T/D 24.82 + 0.43 = 25.25		
W/L 14.99 - 0.56 = 14.43		
Note - Perhaps from ≃ 20' on may		
be clean sand, mixing w/ black stuff		
from above. Speculation only!		

COUNTY Elkhart #11(2) TWP. 38N RGE. 4E NW ¼ SE ¼ NE ¼ SEC 36 5-1-79

FOR ADMINISTRATIVE USE ONLY (Well driller does not fill out) LAT: 41° 42' 18" LONG: 86° 04' 24" 1/12/93 DAS

Topo Map Osceola 900 Ft W of EL. Ground Elevation 769

Field Located By USGS Date 5/3/79 Ft N of SL. Depth to bedrock

Courthouse Location By Date Ft E of WL. Bedrock elevation

Location accepted w/o verification by 1700 Ft S of NL. Aquifer elevation Lot Number

Subdivision Name

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

SITE N

WATER WELL RECORD

HIMCO Landfill N

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled ELKHART Civil Township ______

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc.

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner USGS Address 1819 N MERIDIAN

Building Contractor ______ Address ______

Name of Well Drilling Contractor: SAME

Address ______

Name of Drilling Equipment Operator: WATSON / DUWERIUS

WELL INFORMATION

Depth of well: 29.95 Date well was completed: 4/30/79

Diameter of casing or drive pipe: 2" PLASTIC Total Length: 25'

Diameter of liner (if used): — Total Length: ______

Diameter of Screen: 2" Length: 5' Slot Size: 40

Type of Well: Drilled ☒ Gravel Pack ☐ Driven ☐ Other ______

Use of Well: OBSERVATION For Home ☐ For Industry ☐ For Public Supply ☐ Stock ☐

Method of Drilling: AUGER Cable Tools ☐ Rotary ☐ Rev. Rotary ☐ Jet ☐ Bucket Rig ☐

Static water level in completed well (Distance from ground to water level) 8.41 feet

Bailer Test: Hours Tested ______ Rate ______ g.p.m. Drawdown ______ ft.

Pumping Test: Hours Tested ______ Rate ______ g.p.m. Drawdown ______ ft.

(Drawdown is the difference between static level and water level at end of test)

Signature ______

Date ______

FOR WELL LOG SPACE USE REVERSE SIDE OF THIS SHEET

WATER WELL LOG

FORMATIONS (Color, type of material, hardness, etc.)	From	To
Med br sand + clay	0	3
Med br sand	3	7
Med br sand & fine grvl	7	17
Water Table ≃ 8'		
Grey med sand & fine grvl	17	
w/ tr coarse grvl		32
BTH 32'		
5' SS 40 slot screen		
Pumped ≃ 20 gpm		
W/L 9.99 - 1.58 = 8.41		
T/D 29.52 + .43 = 29.95		
Set in meter box		

FOR ADMINISTRATIVE USE ONLY
(Well driller does not fill out)

COUNTY Elkhart #N TWP. 38N RGE. 4E

LAT: 41° 42' 10" LONG: 86° 0' 33"

SE ¼ SW ¼ NE ¼ SEC 36

Topo Map Osceola

Field Located By USGS Date 4/30/79

Courthouse Location By ______ Date ______

Location accepted w/o verification by ______

1900 Ft W of EL.

______ Ft N of SL.

______ Ft E of WL.

2200 Ft S of NL.

Ground Elevation 763

Depth to bedrock ______

Bedrock elevation ______

Aquifer elevation ______

1/12/93 DAS 4-30-79

Subdivision Name ______

Lot Number ______

HIMCO Landfill

O

SITE O

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled ELKHART Civil Township

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc.

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner U.S.G.S. Address 1819 N. MERIDIAN, INDPLS.

Building Contractor — Address

Name of Well Drilling Contractor: SAME

Address

Name of Drilling Equipment Operator: DIWELIUS / WATSON

WELL INFORMATION

Depth of well: 30' Date well was completed: 5/1/79

Diameter of casing or drive pipe: 2" PLASTIC Total Length: 25'

Diameter of liner (if used): — Total Length:

Diameter of Screen: 2" Length: 5' Slot Size: 40

Type of Well: Drilled ☒ Gravel Pack ☐ Driven ☐ Other

Use of Well: OBSERVATION For Home ☐ For Industry ☐ For Public Supply ☐ Stock ☐

Method of Drilling: AUGER Cable Tools ☐ Rotary ☐ Rev. Rotary ☐ Jet ☐ Bucket Rig ☐

Static water level in completed well (Distance from ground to water level) 7.94' feet

Bailer Test: Hours Tested Rate g.p.m. Drawdown ft.

Pumping Test: Hours Tested Rate g.p.m. Drawdown ft.

(Drawdown is the difference between static level and water level at end of test)

Signature

Date

SITE O

FOR ADMINISTRATIVE USE ONLY
(Well driller does not fill out)

LAT: 41° 42' 23"
LONG: 86° 0' 15"
1/12/93
DAS

5/1/

COUNTY ELKHART TWP. 38N RGE. 4E SE ¼ NE ¼ NE SEC 36 Subdivision Name

Topo Map Osceola

Field Located By USGS Date 5/1/79

Courthouse Location By ______ Date ______

Location accepted w/o verification by ______

______ Ft W of EL.

______ Ft N of SL.

______ Ft E of WL.

1100 Ft S of NL.

Ground Elevation 764

Depth to bedrock ______

Bedrock elevation ______

Aquifer elevation ______

Lot Number ______

WATER WELL LOG

From	To	FORMATIONS (Color, type of material, hardness, etc.)
0	8	V. Fine Lt. Brown Sand
8	20	Fine - Med Brown Sand (Wet)
20	28	Med - Course Sand w/ Sm. Gravel
28	37	Med - Course Sand w/ Med Gravel
37		B.T.H.
		Set 5'x2" - #40 Screen
		Surged & Pumped till Clear
		W/L = 9.99 - 2.05 = 7.94
		TD = 29.72 + .43 = 30.15
		Well set in meter box @ site

HIMCO Landfill

P

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

SITE P

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled Elkhart Civil Township Cleveland

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc.

NW corner of Bristol and Nappanee

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner U.S. G.S. Address 1819 N. Meridian, Indpls.

Building Contractor ______ Address ______

Name of Well Drilling Contractor: U.S G.S.

Address ______

Name of Drilling Equipment Operator: Ouwelius & Watson

WELL INFORMATION

Depth of well: 25' Date well was completed: 5-3-79

Diameter of casing or drive pipe: 2" P.V.C. Total Length: 20'

Diameter of liner (if used): ______ Total Length: ______

Diameter of Screen: 2" Length: 5' Slot Size: 18

Type of Well: Drilled ☒ Auger Observation Gravel Pack ☐ Driven ☐ Other ______

Use of Well: For Home ☐ For Industry ☐ For Public Supply ☐ Stock ☐

Method of Drilling: Cable Tools ☐ Rotary ☐ Rev. Rotary ☐ Jet ☐ Bucket Rig ☐

Static water level in completed well (Distance from ground to water level) 6.76 feet

Bailer Test: Hours Tested ____ Rate ____ g.p.m. Drawdown ____ ft.

Pumping Test: Hours Tested ____ Rate ____ g.p.m. Drawdown ____ ft.

(Drawdown is the difference between static level and water level at end of test)

Signature ______

Date ______

FOR WELL LOG SPACE USE REVERSE SIDE OF THIS SHEET

FOR ADMINISTRATIVE USE ONLY LAT 41° 42' 14" 1/12/93 5-3-79
(Well driller does not fill out) Long 86° 0' 15" DAS

COUNTY Elkhart #P TWP. 38N RGE. 4E SE ¼ SE ¼ NE SEC 36 Subdivision Name

Topo Map Osceola | 50 Ft W of EL. | Ground Elevation 762

Field Located By USGS. Date 5-3-79 | 3200 Ft N of SL. | Depth to bedrock

Courthouse Location By ______ Date ______ | ______ Ft E of WL. | Bedrock elevation

Location accepted w/o verification by ______ | ______ Ft S of NL. | Aquifer elevation ______ Lot Number ______

WATER WELL LOG

FORMATIONS (Color, type of material, hardness, etc.)	From	To
Dk Br. sand w/some clay	0	2
Yellowish Br fine sand	2	7
Water Table 7'		
Br. fine sand	7'	27'
BTH 27'		
Set PVC casing 2"		
Set 5' 18 slot USS screen/pt		
Drilled 5' west of Tape		
Pumped = 25 gpm		
W/L 7.99 - 1.23 = 6.76		
T/D 23.88 + 1.43 = 25.31		

– Site

Q

HIMCO Landfill

Q

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled ELKHART Civil Township ______

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc.

______

______

______

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner USGS Address 1819 N MERIDIAN

Building Contractor — Address ______

me of Well Drilling Contractor: SAME

ess ______

Name of Drilling Equipment Operator: DOUGLUS / WATSON

WELL INFORMATION

pth of well: ______ Date well was completed: 4/26/79

Diameter of casing or drive pipe: 2" PLASTIC Total Length: 20'

Diameter of liner (if used): — Total Length: ______

Diameter of Screen: 2" Length: 5' Slot Size: 40

Type of Well: Drilled ☒ Gravel Pack ☐ Driven ☐ Other ______

Use of Well: OBSERVATION For Home ☐ For Industry ☐ For Public Supply ☐ Stock ☐

Method of Drilling: AUGER Cable Tools ☐ Rotary ☐ Rev. Rotary ☐ Jet ☐ Bucket Rig ☐

Static water level in completed well (Distance from ground to water level) 4.95 feet

Bailer Test: Hours Tested ______ Rate ______ g.p.m. Drawdown ______ ft.

ing Test: Hours Tested ______ Rate ______ g.p.m. Drawdown ______ ft.

(Drawdown is the difference between static level and water level at end of test)

Signature ______

Date ______

SITE Q

FOR ADMINISTRATIVE USE ONLY
(Well ... does not fill o...)

LAT: 41° 41' 59"
LONG: 86° 0' 22"
1/12/93
DAS

COUNTY ELKHART TWP. 38N RGE. 4E SE ¼ NE ¼ SE SEC 36 Subdivision Name

Topo Map Osceola | 600 Ft W of EL. | Ground Elevation 756

Field Located By USGS Date 4/26/79 | 1900 Ft N of SL. | Depth to bedrock

Courthouse Location By ______ Date ______ | ______ Ft E of WL. | Bedrock elevation ______

Location accepted w/o verification by ______ | ______ Ft S of NL. | Aquifer elevation ______ | Lot Number ______

WATER WELL LOG

To	From	FORMATIONS (Color, type of material, hardness, etc.)
13	0	FINE BROWN SAND
	13	MED-COURSE GREY SAND
	32	B.T.H.
		HOLE CAVED 1' BELOW G.L. COULD NOT
		GET BENTONITE IN HOLE
		SET 2" x 5' - 40 SLOT SCREEN
		SURGED & PUMPED TILL CLEAR
		W/L = 6.99 - 2.04 = 4.95
		TD = 21.63 + .44 = 22.07
		ABOUT 3' OF SAND IN SCREEN
		SHOULD BE BLOWN W/ AIR
		LOCATION ≈ 2' W + 6' S
		OF FIRE HYDRANDANT @ SITE Q
		WELL IS SET IN METER BOX

Donohue

Engineers & Architects

COMPUTER AIDED DESIGN/DRAFTING

BORING LOG

SOIL BORING NO. BRG-01

SITE: HIMCO DUMP PROJECT NO. 20023 003

DRILLING METHOD: CME 550 4 1/4" I.D. HOLLOW-STEM AUGERS (0-25' ?)

LOG BY: R. CANNESTRA

DRILLER: D. ELLIS

WEATHER: PTLY CLDY, 45°, N-W WIND

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING
[illegible]	[illegible]	[illegible]	[illegible]

PHYSICAL SETTING: GRASS ADJACENT TO LANDFILL

GROUND SURFACE ELEV.:

COORDINATES:

NORTH:

EAST:

DATE START: 11/12/90

DATE COMPLETE:

WELL INSTALLATION: WT-10A

BKGRND HNu 0.2

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	B	N	SAMPLE TYPE	SAMPLE INTERVAL	TIME	PID	O_2 / LEL	H_2S / CO	
0	EOLIAN	[illegible]	MED DENSE 10YR 2/1 BLACK SILTY SAND, TOPSOIL		22	SS-1 3"	0-2' 0.2 IN SPOON	13:51	0.2	21.2/0	0/0	A
1	OUTWASH	SP	MED. DENSE 10YR 5/6 YELLOWISH BROWN SAND (MEDIUM SUBANG. FROSTED QUARTZITIC GRAINS) TR F SD SAND, TR SM GRAVEL (SUBANG-ANG, DOLOMITIC CLASTS) NON-PLAS NON COHESIVE, TR SILT, DAMP		19							
2	OUTWASH	SP	MED. DENSE, 10YR 5/4, YELLOWISH BROWN SAND (F-M, SUBANG-ANG, FROSTED, QUARTZITIC GRAINS) NON PLASTIC, NON COHESIVE, SOME FeO_2 STAINING & MOTTLING IN LOWER PART OF SPOON, DAMP		16	SS-2 3"	2'-4' 0.2 IN SPOON	13:57	0.2	21.1/0	0/0	B
4	OUTWASH	SP	MED DENSE MOTTLED 10YR 7/4 & [illegible] VERY PALE BROWN/DARK YELLOWISH BROWN SAND (MEDIUM SUBANG-SUBRND FROSTED QUARTZITIC GRAINS) TR C SAND TR SMALL GRAV (ANG-SUBANG, DOLOMITIC CLASTS) NON PLASTIC, NONCOHESIVE, DAMP. NOTE TIP OF SPOON APPEARS WET		17 / 19	SS-3 3"	4'-6' 0.2 IN SPOON	14:24	0.2	21.1/0	0/0	C
6	OUTWASH	SP	MED. DENSE 10YR 5/6 YELLOWISH BROWN SAND (MEDIUM SUBANG-SUBRND FROSTED QUARTZITIC GRAINS) TRACE C SAND, TR SM GRAVEL (ANG DOLOMITIC CLASTS) NON PLASTIC NON COHESIVE MOIST-WET. COLOR CHANGE @ 7.4 TO 10YR 5/3 BROWN, SLIGHT COARSENING @ THIS DEPTH ALSO		13 / 22	SS-4 3"	6'-8' 0.2 IN SPOON	14:29	0.2 DUPLICATE	21.1/0	0/3	D
8	OUTWASH	SP	LOOSE 10YR 5/4 YELLOWISH BROWN SAND (MEDIUM SUBANG-SUBRND FROSTED QUARTZITIC GRAINS) TR C SAND NON PLASTIC, SLIGHT COHESION, SATURATED		10	SS-5 3"	8'-10' 0.2 IN SPOON	14:46	0.2	21.2/0	0/0	E
10	OUTWASH	SP BROWN / BLACK	VERY LOOSE 10YR 5/4 YELLOWISH BROWN SAND (MEDIUM-C SUBANG-SUBRND QUARTZITIC GRAINS), NON PLAS NON COHESIVE. @ 10.7 COLOR CHANGE TO 7.5YR [illegible] BLACK SAND (M-C, SUBANG-SUBRND, FROSTED, QUARTZITIC GRAINS) TR GRAVEL SUBANG, [illegible] DOLO CLASTS [illegible] NON [illegible] SATURATED NO ODOR		3 / 12	SS-6 3"	10'-12' 0.2 IN SPOON	15:00	0.2	21.1/0	0/0	F
12	OUTWASH	SP	VERY DENSE 10YR [illegible] DARK GRAY SAND (MEDIUM [illegible] FROSTED QUARTZITIC GRAINS) TR SM GRAVEL (SUBANG DOLOMITIC CLASTS) NON PLASTIC NONCOHESIVE, [illegible] SATURATED		52 / 12	SS-7 3"	12'-14' 0.2 IN SPOON	15:15	0.2	21.1/0	0/0	G
14			DENSE 10YR 4/1 GRAY SAND (MEDIUM, SUBANG-SUBRND FROSTED QUARTZITIC GRAINS, TR [illegible] GRAVEL [illegible]		47	SS-8 3"	14'-16'	15:27	0.2	21.1/0	0/0	

14:53

BENZ

Sheet __ of __

Donohue
Engineers & Architects
COMPUTER AIDED DESIGN/DRAFTING

BORING LOG

SITE: HIMCO DUMP PROJECT NO. 20026023

SOIL BORING NO. BRG-01

DRILLING METHOD: CME 550
5¼ IN I.D HOLLOW STEM AUGERS (0.65' OD)
LOG BY: R CANNESTRA
DRILLER: D. ELLIS
WEATHER:

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING:

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:
DATE START: 11/12/90
DATE COMPLETE: 11/12/90
WELL INSTALLATION: WT-101A

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	B	N	A	R	SAMPLE TYPE	INTERVAL	TIME	PID	O2 LEL	H2S
		SP	NON PLASTIC, NON COHESIVE, FETID ODOR, SATURATED				13			SEE PREVIOUS PAGE			
16			BLIND DRILL BRG-01 TO 17.0' TO ALLOW FOR 'SLEEVE' DURING WELL INSTALLATION. NO SAMPLE TAKEN 15.0' TO 17.0'										
17			END OF BORING BRG-01 11/12/90 @ 15:40 TOTAL DEPTH 17.0'										
18			R. Cannestra										
19													
20													

Form

Donohue

Engineers & Architects

COMPUTER AIDED DESIGN/DRAFTING

Water Table Well Installation Diagram

Site: HIMCO DUMP

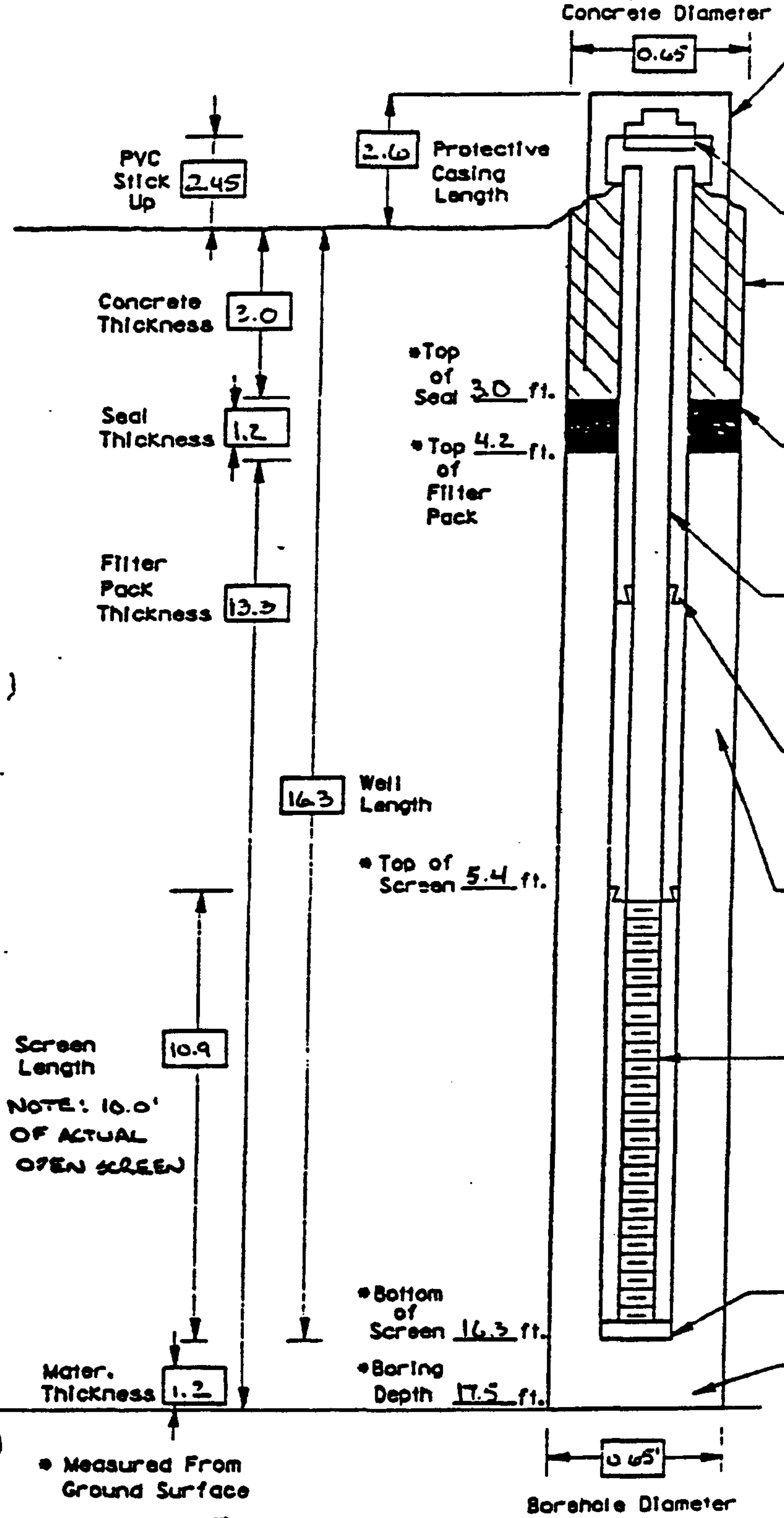
Inspected By:

Date: NOVEMBER 12, 1990

Project No. 20026.003

Well No. WT-101A

Driller/Contractor



* Measured From Ground Surface

PROTECTIVE CASING

✓ GUARD POSTS WOOD

Type STEEL Vented (Yes)/No Type [illegible]

Diameter 4" Locked YES MASTER

Length 5.6 Key # 2032

CAP OR PLUG Vented (Yes)/No Type PVC SLIP COVER AND THREADED PLUG

CONCRETE COLLAR

Cement PALMIX 150 lbs.+Water 0 gal.

Total Quantity gal.

Manufacturer PALMIX (PRE MIXED)

SEAL

Powder/Granular/(Pellets) 3/8" Quantity 3.0

Hydrated 3 gal., Time 16:50 - 02 ...

Manufacturer PELONITE by BOCTEST INC

PIPE

Type FLUSH THREADED STAINLESS Schedule TYPE 5 #3...

O.D. 2.0 " I.D. 1.9

Length/Sec. 10.0 No. Of Sec. PARTIAL

Manufacturer DIEDRICH

JOINTS Flush Threaded (Yes)/No

Teflon Taped (Yes)/No O-Ring Yes/(No)

Manufacturer ACE HARDWARE

FILTER PACK Type(s) SILICA SAND #10-20

Source COLORADO SILICA SAND

Volume 3.25 100lb BAGS ~ 22 gal

Manufacturer COLORADO SILICA SAND, INC. COLORADO ~~SILICA~~ SPRINGS

SCREEN

Type STAINLESS STEEL CONTINUOUS WRAP Schedule TYPE 5 #304

Length/Sec. 5.3 No. of Sec. 2

O.D. 2.0 " I.D. 1.9

Slot Size 0.010 No. Slots/ft.

Manufacturers DIEDRICH

CAP OR PLUG Type THREADED BLANK CAP Length 0.3

MATERIAL COLLAPSE AND FILTER PACK

WATER SOURCE ELKHART MUNICIPAL WATER SUPPLY

Notes:

Donohue

Engineers & Architects
COMPUTER AIDED DESIGN/DRAFTING

BORING LOG

SOIL BORING NO. P10B

SITE: Himco Dump PROJECT NO. 20030.073

DRILLING METHOD: 7 7/8" Blade bit Air rotary 8" driven casing

LOG BY: TOM PUCHALSKI
DRILLER: John Mathes / Mike Tinnin
WEATHER: 30° [illegible]

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING: Grass field

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:
DATE START: 12/13/90
DATE COMPLETE:
WELL INSTALLATION:

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	TIME	PID	O_2 / LEL	CO / H_2S
0		SM											
10		SM	10 YR 4/1 Dark Grey Medium Grained Silty Sand, wet							1600	0	21.3 / 0.07	0.0 / 0.0
20–40		GP	Poorly graded Gravel 65% 1" dia. stony, [illegible] & black igneous, 30% med grn dark grey sand, saturated							1645	0	21.3 / 0.07	0.0 / 0.0
50–60		SM	10 YR 4/1 Dark Grey Silty Sand, medium grained, saturated							1730	0	21.3 / 0.07	0.0 / 0.0
			STOP 1801 12/13/90 START 1107 12/14/90										
70		GW	Well graded GRAVEL 85% 1/2-3" shard & stony gvl 15% medium grained sand wet										
		SM	10 YR 4/1 Grey SILTY SAND 60% fine grn sand, 40% silt							1109	0	21.3 / 0.07	0.0 / 0.0
80–90		~~SR~~											
90–100		SM	10 YR 5/3 Greyish Brown SILTY SAND 70% fine grn sand 30% silt, saturated							1330	0	21.3 / 0.07	0.0 / 0.0

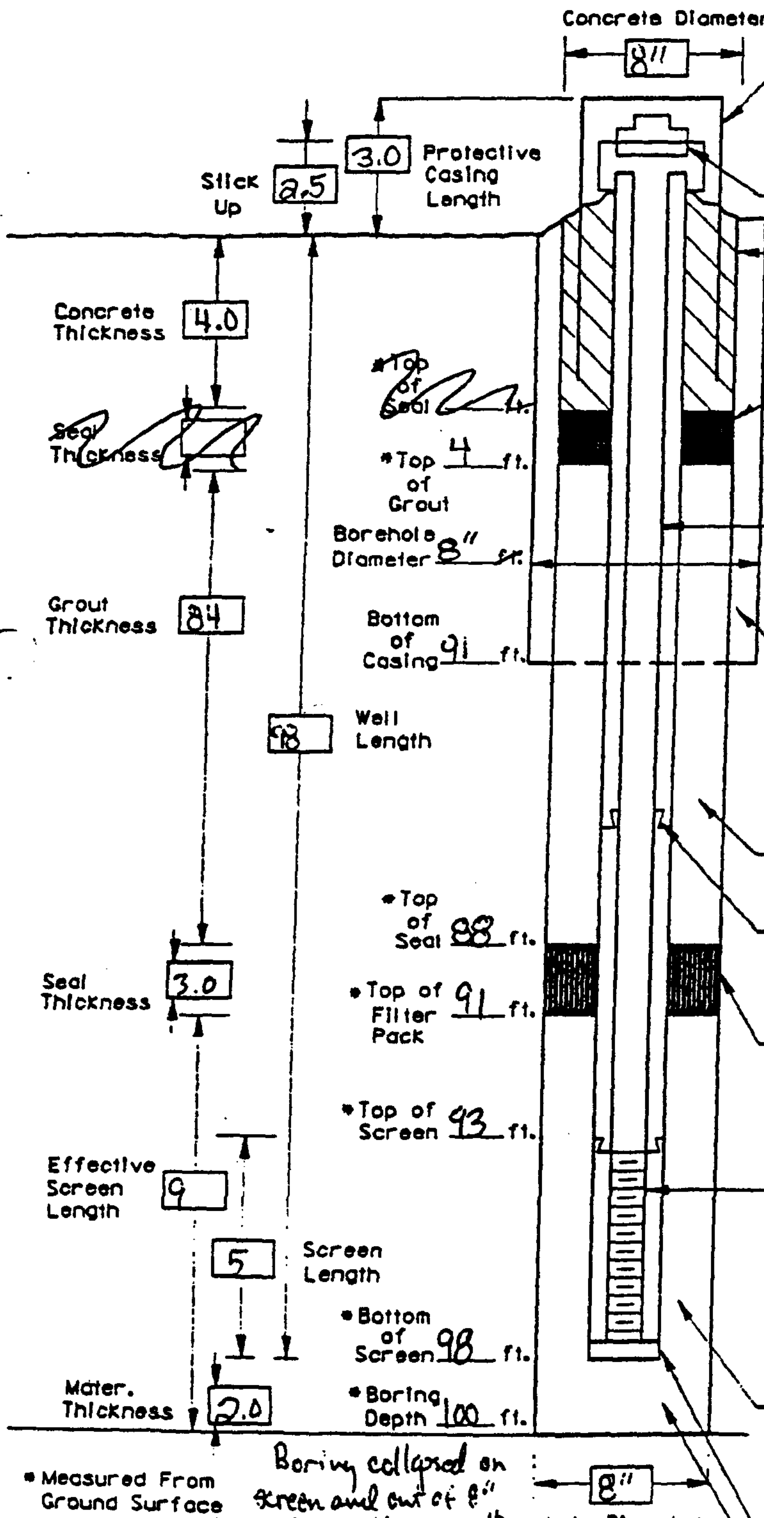
This is an approximate log based upon cuttings blown out of the boring during air rotary drilling.

Form 104

Donohue DOUBLE CASING WELL/PIEZOMETER INSTALLATION DIAGRAM

Engineers & Architects
COMPUTER AIDED DESIGN/DRAFTING

Site: Himco Dump Date: 12/14/90
Inspected By: Tom Pucholski Project No. 20026.023 Well No. P101B
Driller/Contractor Max Tinnin Don Breningtor / Mathes



* Measured From Ground Surface

Boring collapsed on screen and out of 8" casing as it was pulled

PROTECTIVE CASING
Type Steel
Diameter 4"
Length 6.0'
Vented Yes/No
Locked Yes National
Key # KA675

GUARD POSTS
Type Steel/cement filled

CAP OR PLUG Vented Yes/No Type PVC

CONCRETE COLLAR
Cement 165 lbs.+Water ~~12~~ 5 gal.
Total Quantity 12 gal.
Manufacturer Rite Mix

UPPER SEAL
Powder/Granular/Pellets Quantity gal.
Hydrated gal., Time
Manufacturer

PIPE Type Stainless Steel Schedule 5 Type 304
O.D. 2.4" I.D. 2.0"
Length/Sec. 10 feet No. Of Sec. 10
Manufacturer Dietrich

GROUT Type Cement/Bentonite 1 Batch 12/14
Mix 846 lbs. of Type I A Portland +
45 lbs. of bentonite powder +
Water 80 gals. Total Quant. 150 gal.
Manufacturers Portland-Lafarge Bentonite with BF

OUTSIDE GROUT Type
AMOUNT

JOINTS Flush Threaded Yes/No
Teflon Taped Yes/No O-Ring Yes/No
Manufacturer Dietrich

LOWER SEAL
Powder/Pellets Quantity 10 lbs ~~gal~~
~~Hydrated~~ Slurry 15 gal., ~~Time~~
Manufacturer Naturalgel WYOBEN PRODUCTS

SCREEN
Type Schedule
Length/Sec. 5 ft No. of Sec. 1
O.D. 2.4" I.D. 2.0"
Slot Size .010 ~~No. Slots/ft.~~
Manufacturer Dietrich

FILTER PACK Type(s) Natural Formation Sand
~~Source~~ Fine silty Sand ~~Volume~~ ~~gal.~~
~~Manufacturer~~

PLUG OR CAP Type Stainless Length 1"

MATERIAL Natural Formation Fine grained Silty Sand

WATER SOURCE Fire hydrant in front of Elkhart Water Works

Notes:

Donohue
Engineers & Architects
COMPUTER AIDED DESIGN/DRAFTING

BORING LOG

SOIL BORING NO. P101C

SITE: Himco Dump PROJECT NO. 20026

DRILLING METHOD: Air Rotary with casing driver

LOG BY: S. Padovani

DRILLER: Max Tiernin-Mathes

WEATHER: cold/rain mixed w/ snow - High winds

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING: Grass field

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:
DATE START: 12/3/90
DATE COMPLETE: 12/12/90
WELL INSTALLATION: 12/12/90

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	TIME	PID	O_2/LEL
			Multicolored ~~[illegible]~~ coarse grained sand with pebbles							1000	.2	20.[illegible]/0
10	10											
20	20		Poorly sorted multicolored medium to coarse grained sand with pebbles							1600	.2	20.8/0
30	30											
40	40		SAND + Gravel							1700	.2	20.[illegible]/0
50			Multicolored medium to coarse grained sand w/ pebbles									
60												
70												
80										1100	.2	20.[illegible]/0
90			Fine to medium grained sand									
100			Fine to medium grained sand							1100	.2	20.[illegible]/0
110												
120			medium grained sand w/ <10% fine grained sand							1200	.2	20/0
130												
140			BLIND DRILLING									

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COMPUTER AIDED DESIGN/DRAFTING

BORING LOG

SOIL BORING NO. P-101C

SITE: Himco Dump PROJECT NO. 20026.023

DRILLING METHOD: 7 7/8" Blade Bit
140-165 Air rotary 0-140 wash 140-165
0-140 7 7/8" tricone
LOG BY: TOM PUCHALSKI
DRILLER: MAX TINNIN DON BREWINGTON
WEATHER: Clear, 40s SE wind 10-15mph

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING: Gas field

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:
DATE START: 12/3/90
DATE COMPLETE: 12/12/90
WELL INSTALLATION: 12/12/90

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	TIME	PID	O_2/LEL	H_2S
140		SP	10YR 5/3 Brown SAND, saturated										
150		SM	153' 10YR 5/2 Grayish Brown SILTY SAND 30-40% Silt - Rest fine sand										
		CL	Gray SILTY CLAY - On bit							1127	0	21.6/0.0	0
160		CL	Gray SILTY CLAY - on drill bit Wash rotary to 165' 12/12/90 858										
170			LOST ~~200~~ ~100 SEP 12/12/90 gallons to formation 1515 12/12/90 EOB 175' 12/12/90 1538 FEP										
180			LOST ~160 gallons inside casing during attempted well installation on 12/11/90 ~~858~~ SEP										

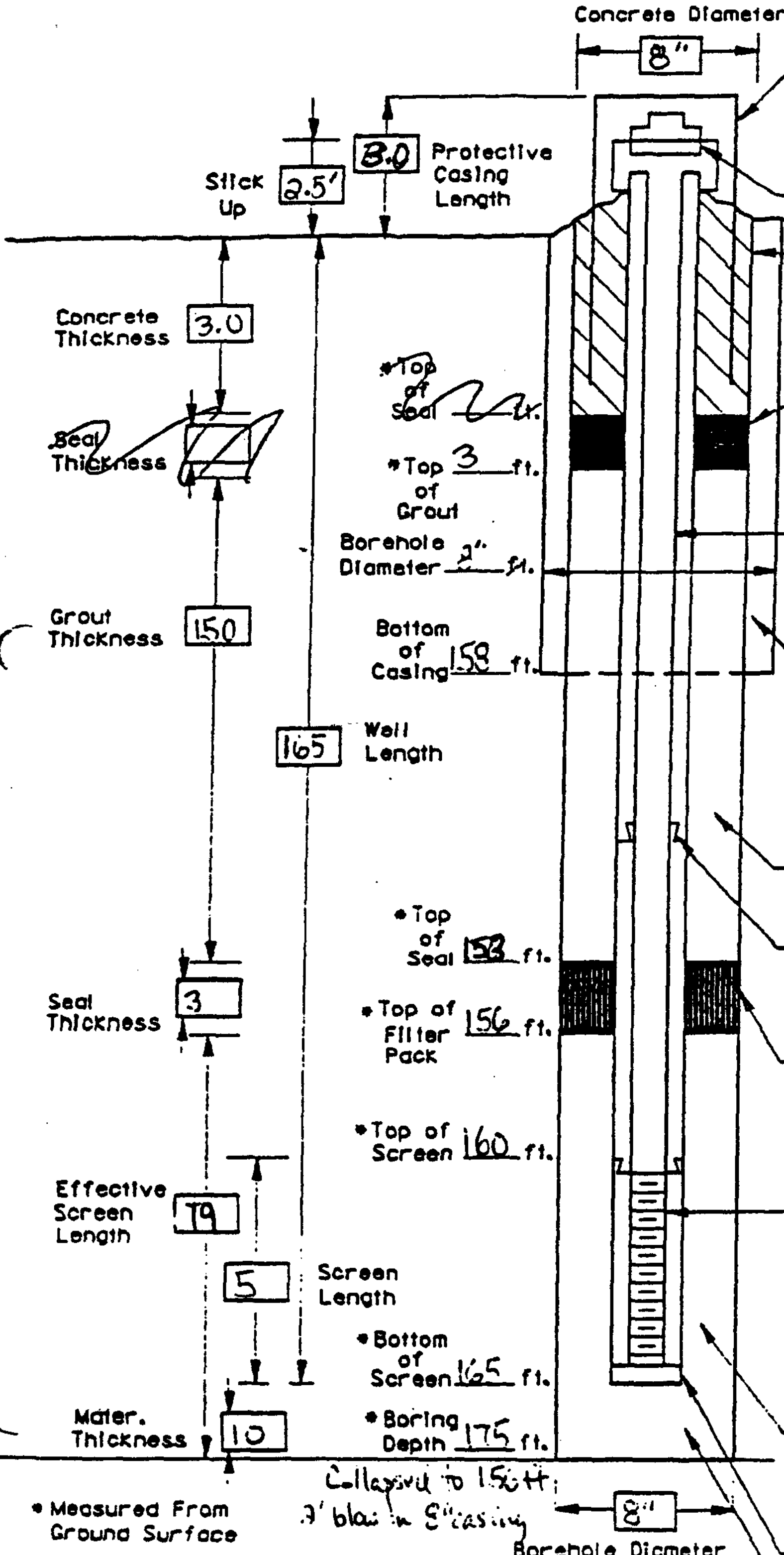
This log is approximate. It is based on cuttings produced during air rotary drilling.

Donohue DOUBLE CASING WELL/PIEZOMETER INSTALLATION DIAGRAM

Form

Engineers & Architects
COMPUTER AIDED DESIGN/DRAFTING

Site: HIMCO DUMP Date: 12/12/90
Inspected By: Tom Puchalak Project No. 20026.023 Well No. P1C1 C
Driller/Contractor MAX TINNIN, DON PREWINGTON / MATHES



PROTECTIVE CASING

Type Steel Vented Yes/No
Diameter 4" Locked Yes National Fill
Length 6.0' Key # KA675

GUARD POSTS

Type Steel/Concrete

CAP OR PLUG Vented Yes/No Type PVC

CONCRETE COLLAR

Cement 5 lbs.+Water 2 1/2 gal.
Total Quantity 6 gal
Manufacturer Rite Mix

UPPER SEAL

~~Powder/Granular/Pellets Quantity gal~~
~~Hydrated gal., Time~~
~~Manufacturer~~

PIPE Type Stainless Steel Schedule 5 Type 304
O.D. 2.4" I.D. 2.0"
Length/Sec. 10 feet No. of Sec. 16 + 1 cut
Manufacturer Dietrich

GROUT Type Cement / Bentonite 3 Batches
Mix 846 lbs. of TYPE I A Portland +
45 lbs. of Bentonite powder +
Water 80 gals. Total Quant. 150 gal.
Manufacturers Portland-Lafarge Bentonite Wyo-Ben

OUTSIDE GROUT ~~Type~~
~~AMOUNT~~

JOINTS Flush Threaded Yes/No
Teflon Taped Yes/No O-Ring Yes/No
Manufacturer Dietrich

LOWER SEAL

Powder/~~Pellets Quantity~~ 10 lbs ~~gal.~~
Hydrated Slurry 10 gal., ~~Time~~
Manufacturer NATURAL GEL WYO-BEN PRODUCTS

SCREEN

Type Continuous Wrap Stainless Schedule 5
Length/Sec. 5 ft No. of Sec. 1
O.D. 2.4" I.D. 2.0"
Slot Size .010 ~~No. Slots/ft.~~
Manufacturer Dietrich

FILTER PACK Type(s) Natural Formation
~~Source~~ Fine Silty Sand ~~Volume gal.~~
~~Manufacturer~~

PLUG OR CAP Type Stainless Length 1"

MATERIAL Natural Formation - SM

WATER SOURCE Fire Hydrant in front of Elkhart Waterworks

Donohue
Engineers & Architects
COMPUTER AIDED DESIGN/DRAFTING

BORING LOG

SOIL BORING NO. BRG-2

SITE: HIMCO DUMP PROJECT NO. 20026.

DRILLING METHOD: 0 ws' cd (4 1/4 in ID) HOLLOW STEM AUGERS WITH CME 550

LOG BY: R. CANNESTRA

DRILLER: D. ELLIS

WEATHER: CLEAR, LT BREEZE, 46°-48°

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING
[illegible]	[illegible]	[illegible]	[illegible]

BACKGROUND PID 0.2

PHYSICAL SETTING: ___

GROUND SURFACE ELEV.: ___
COORDINATES: ___
NORTH: ___
EAST: ___
DATE START: 11/10/90
DATE COMPLETE: ___
WELL INSTALLATION: WT-102A

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	TIME	PID	O_2 / LEL	RAD
0–1.0	EOLIAN	OL-SM	MD 10YR 3/2, DK BROWN SILTY ORGANIC SAND, SAND F-M, TR [illegible] GRAV (SBANG [illegible]) [illegible] COHESIVE, NONPLASTIC, MOIST		11			SS-1 3"	0-2 0.2 IN SPOON	13:35	0.2	20.5/0	0
1.0–2	OUTWASH	SP-SM	MD, 10YR 3/6, DK YELLOWISH BROWN SILTY SAND, SAND (M-F), TR Sm, [illegible], SBANG GRAVEL, SLIGHT COHESIVE, NON PLASTIC, MOIST				20						
2–4		SP	MD, 10YR 4/6 DK YELLOWISH BROWN SAND, F-M SUBROUNDED FROSTED QUARTZITIC GRAINS, TR (7-8%) Sm-M SUBANG TO SUBRND [illegible] GRAVEL, NON PLASTIC, NON COHESIVE, MOIST - DAMP		13		17	SS-2 3"	2-4 0.2 IN SPOON	13:45	0.2	20.5/0	0
4–6		SP	D 10YR 6/3 PALE BROWN SAND, FM QUARTZITIC FROSTED, SUBANG-SUBRND GRAINS, NON PLAS, NON COHESIVE, MOIST, Tr		22			SS-3 3"	4-6 0.2 IN SPOON	14:20	0.2	20.5/0	0
5			MOTTELED W/ DK YELLOWISH BROWN @ 5.5						SPLIT SAMPLE W/ MILES				
6–8	OUTWASH	SP	MD, 10YR 6/3, PALE BROWN MOTTELED W/ 10YR 5/8 SAND, F-M, QUARTZITIC, FROSTED, SUBRND-RND GRAINS, TR SILT, NON PLASTIC, SLIGHT COHESION, TR ORGANIC FRAGMENTS, MOIST		27		18	SS-4 3"	6-8 0.2 IN SPOON	14:26	0.2	20.4/0	0
8–10		SP	MD, 10YR 6/4, LT YELLOWISH BROWN SAND F-M SUBRND, FROSTED, QUARTZITIC GRAINS, TR [illegible], NON PLASTIC, SLIGHT COHESION, TR Co SAND, MOIST - WET. @ 9.5 FT COLOR CHANGE TO		14			SS-5 3"	8-10 0.2 IN SPOON	14:58	0.2	20.5/0	0
10–12	OUTWASH	SP	MD, 10YR 4/4 DK YELLOWISH BROWN SAND, F-M, TR F & Co SAND, GRAINS SUBANG-SUBRND, FROSTED, [illegible], NON PLASTIC, NON COHESIVE, TR Sm GRAV [illegible], SATURATED.		20		19	SS-6 3"	10-12 0.2 IN SPOON	15:05	0.2	20.4/0	0
12–14		SP	DENSE 10YR 5/3 BROWN, SAND MEDIUM TR F & Co SAND, GRAINS ANG, QUARTZITIC, [illegible] SUBRND, 2" LAYER OF SILTY FINE SAND @ 12.1, NON COHESIVE, NON PLASTIC, SATURATED		20		16	SS-7 3"	12-14 0.2 IN SPOON	15:[illegible]	0.2	[illegible]/0	0
13		SP-SM											
14–16			VD, 10YR 5/4 YELLOWISH BROWN SAND F-M [illegible]		65			SS-8	14-16	15:42	0.2	/0	0

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COMPUTER AIDED DESIGN/DRAFTING

BORING LOG

SITE: HIMCO DUMP PROJECT NO. 20026

SOIL BORING NO. B2G-02

DRILLING METHOD: 6.25" OD (4¼ IN I.D.) HOLLOW STEM AUGERS W/ CME 550
LOG BY: R. CANNESTRA
DRILLER: D ELLIS
WEATHER: CLEAR, LT BREEZE, 40-48°

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING:

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:
DATE START: 11/10/90
DATE COMPLETE:
WELL INSTALLATION: WT-102A

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	B	N	A	R	SAMPLE TYPE / INTERVAL	TIME	PID	O_2/LEL
			... SUBANG - SUBRND QUARTZITIC FROSTED GRAVEL SUBANG - SUBRND, DOLOMITIC - GRANITIC SATURATED				18	SEE PREVIOUS PAGE			
			END SAMPLING AT 16.0 FT ADVANCE BORING TO 17.8 FT TO ACCOMODATE SLUFF IN BACKSIDE								

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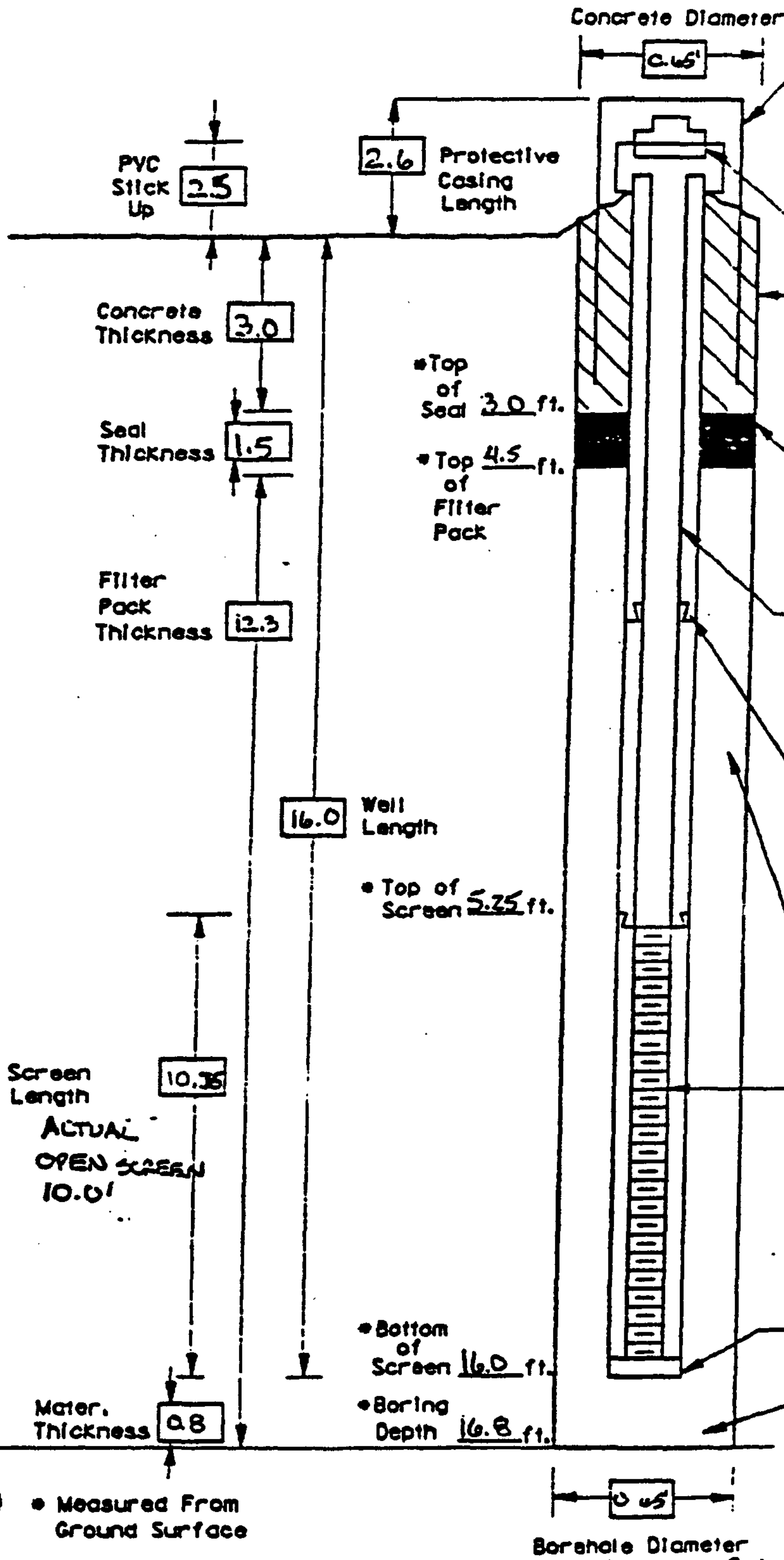
Engineers & Architects
COMPUTER AIDED DESIGN/DRAFTING

Water Table Well Installation Diagram

Form

Site: HIMCO DUMP SITE Date: 11-
Inspected By: R. CANNESTRA R Cannestra Project No. 20026 Well No. WT-102A
Driller/Contractor D. ELLIS / MATHES



PROTECTIVE CASING

GUARD POSTS

Type STEEL Vented (Yes)/No Type LOOSE CAP
Diameter 4" Locked YES, MASTER
Length 5.6' Key # 2532

CAP OR PLUG Vented (Yes)/No Type PVC SLIP CAP W/THREADED PLU

CONCRETE COLLAR

Cement PREE-MIX lbs.+Water ______ gal. ______
Total Quantity 2 BAGS ≈ 7 gal gal. ______
Manufacturer GENERAL CONTRACTORS ST. LOUIS MISSOURI

SEAL

Powder/Granular/(Pellets) 3/8 Quantity 4 g
Hydrated H2O # 3 gal., Time 17:05-17:3
Manufacturer PELONITE, ROCKTEST, INC

PIPE Type STAINLESS STEEL Schedule TYPE 5 GRADE 3C
O.D. 2.0 " I.D. 1.9
Length/Sec. 10 No. Of Sec. PARTIAL
Manufacturer DIEDRICH

JOINTS Flush Threaded (Yes)/No
Teflon Taped (Yes)/No O-Ring Yes/(No)
Manufacturer ACE HARDWARE

FILTER PACK Type(s) SILICA SAND # 10-20
Source COLORADO SILICA SAND CO
Volume 2 1/2 100 lb BAGS ≈ 22.0 g
Manufacturer COLO SILICA SAND CO, COLORADO SPRINGS, COLO.

SCREEN CONTINUOUS WIRE WRAP TYPE 5
Type STAINLESS STEEL Schedule GRADE 304
Length/Sec. 5.3 No. of Sec. 2
O.D. ______ " I.D. ______
Slot Size 0.010 No. Slots/ft. CONTINUOUS WIRE WRA
Manufacturers DIEDRICH

CAP OR PLUG Type STAINLESS STEEL Length 0.15

MATERIAL COLLAPSE & FILTER SAND

* Measured From Ground Surface

WATER SOURCE ELKHART MUNICIPAL WATER PLANT

Notes: BORING EXTENDED TO 16.8 RATHER THAN 16.0 TO ALLOW FOR "SLUFF" WHEN PULLING AUGERS

Donohue

Engineers & Architects
COMPUTER AIDED DESIGN/DRAFTING

BORING LOG

SOIL BORING NO. P102B

SITE: Himco Dump PROJECT NO. 20026

DRILLING METHOD: Air rotary w/ 8" casing driver

LOG BY: S. Paderuni

DRILLER: Max Thorn

WEATHER: Cloudy, Cool 40°F

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING:

GROUND SURFACE ELEV.:

COORDINATES:

NORTH:

EAST:

DATE START: 11/30/90

DATE COMPLETE: 12/1/90

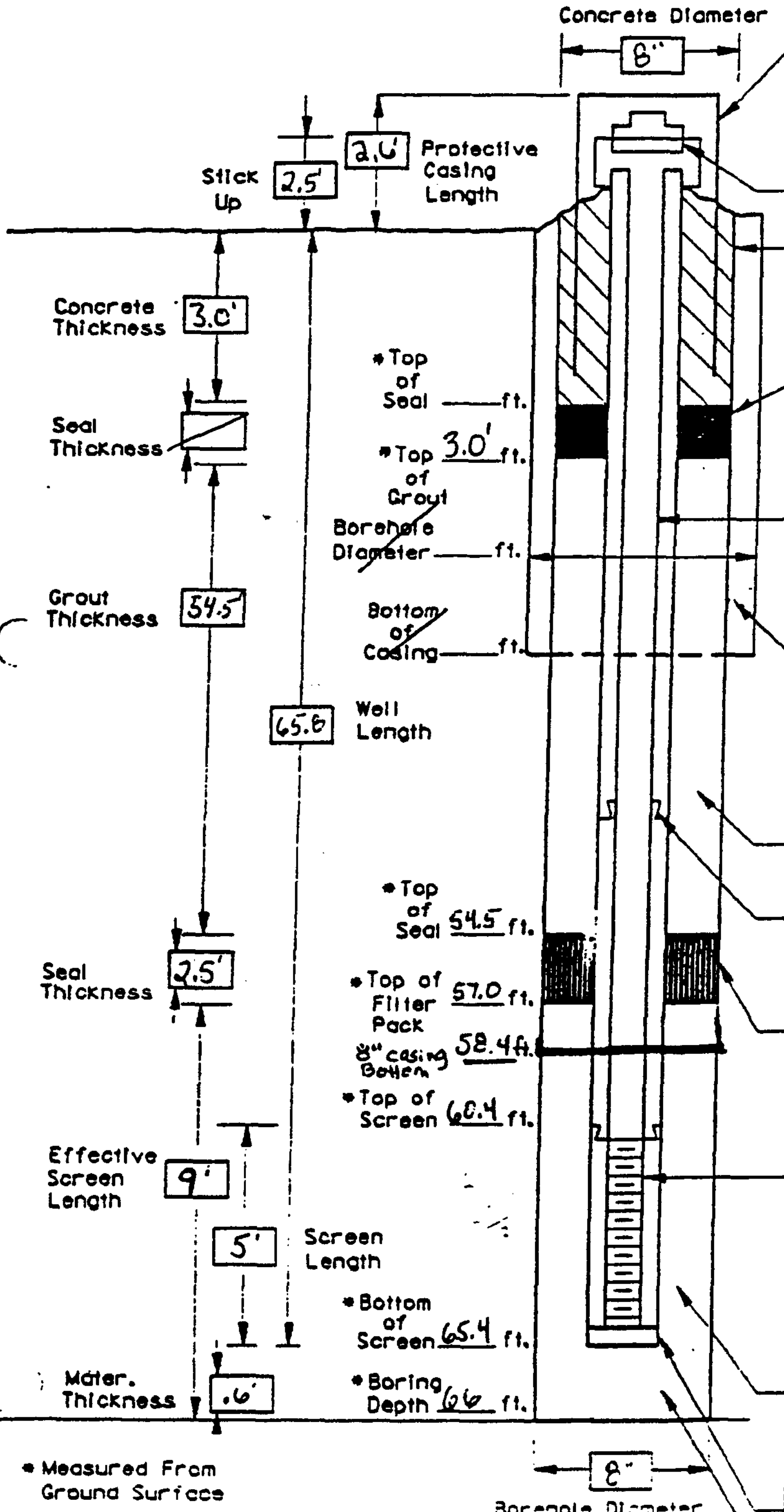
WELL INSTALLATION: 12/1/90

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	TIME	PID	O_2/LEL
			Brown medium to coarse grained Sand with gravel							1130	.2	20.8/0
10												
20			Poorly Sorted sand + Gravel							1500	.2	20.8/0
30												
40			Poorly sorted Sand + Gravel							1550	.20	20.8/0
50												
60			Poorly sorted sand + gravel - Trace clay chunks PLENTY OF WATER							1745	.20	20.8/0
			BLIND DRILLING									

Donohue DOUBLE CASING WELL/PIEZOMETER INSTALLATION DIAGRAM Form

Engineers & Architects
COMPUTER AIDED DESIGN/DRAFTING

Site: Himco Dump Date: 12/2/90
Inspected By: S. Padovani Project No. 20026 Well No. P102B
Driller/Contractor: Max Tinnin / Mathes



* Measured From Ground Surface

WATER SOURCE Elkhart Municipality

PROTECTIVE CASING
Type Steel Vented Yes/No Locked Yes Diameter 4" Length 4' Key # 192-641

GUARD POSTS
Type loose fitted

CAP OR PLUG Vented Yes/No Type PVC

CONCRETE COLLAR
Cement 50 lbs.+Water .5 gal. ___
Total Quantity ___
Manufacturer ___

~~UPPER SEAL~~
Powder/Granular/Pellets Quantity ___
Hydrated ___ gal.. Time ___
Manufacturer ___

PIPE Type Stainless Steel Schedule 5
O.D. 2 3/8" I.D. 2"
Length/Sec. 10' No. Of Sec. 6
Manufacturer Diedrich

~~GROUT~~ Type ___
Mix ___ lbs. of ___ +
___ lbs. of ___ +
Water ___ gals. Total Quant. ___
Manufacturers ___

OUTSIDE GROUT Type Bentonite-Portland Mix
AMOUNT 9 gal H_2O, 9 bags portland (94 lb/bag), 45 lbs ben

JOINTS Flush Threaded Yes/No ___
Teflon Taped Yes/No O-Ring Yes/No
Manufacturer ___

LOWER SEAL
Powder/Pellets Quantity 5
Hydrated by formation water gal..Time 1100
Manufacturer Lafarge

SCREEN
Type Stainless Steel Schedule 5
Length/Sec. 6.8' No. of Sec. 1
O.D. 2 1/4" I.D. 2"
Slot Size 10 No. Slots/ft. 180
Manufacturer Diedrich

FILTER PACK Type(s) Natural grain w/ 4C .3mm
Source Ozark Mountains Volume ___
Manufacturer General Materials

PLUG OR CAP Type Stainless Steel Length 1.5'

MATERIAL Sand + Gravel

Donohue
Engineers & Architects
COMPUTER AIDED DESIGN/DRAFTING

BORING LOG

SITE: Himco Dump PROJECT NO. 20026

SOIL BORING NO. P102C

DRILLING METHOD: Air Rotary

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:

LOG BY: S. Padovani
DRILLER: Max Timm - Mathes
WEATHER: Cold

PHYSICAL SETTING:

DATE START: 11/28/90
DATE COMPLETE: 11/30/90
WELL INSTALLATION: 11/30/90

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	TIME	PID	O_2 / LEL
			Brown medium to coarse grained sand with gravel							1440	.2	20.6/0
10												
20			Poorly sorted grey sand + gravel							1530	.2	20.6/2
30												
40			Poorly sorted sand + gravel							1615	-	20.7/3
50												
60			Poorly sorted sand w/ gravel; Medium grained sand w/ trace clay chunks; ~~Clayey~~ Silty fine grained sand; Sandy silt							1740	.2	21.0/3
70												
80			Sandy silt / silt							1000	.2	21./0
90			Silty clay / clay DRY!!!									
100			Clay (tight)							1130	.2	21.0/0
110			Brownish well sorted medium grained sand. ~~Some~~ Trace gravel pieces @ 116'									
120			Brownish well sorted ~~medium~~ fine grained sand							1230	.2	21.0/0
130			VERY TIGHT FORMATION - Not much water. Takes 1 1/4 hours to drive 30 feet							0	0	17
140			BLIND DRILLING									

Donohue

Engineers & Architects

COMPUTER AIDED DESIGN/DRAFTING

BORING LOG

SOIL BORING NO. P102C

SITE: Homco Dump PROJECT NO. 20026

DRILLING METHOD: Air Rotary

LOG BY: S Padovani

DRILLER: Max Henn - Mathes

WEATHER: Cold

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

GROUND SURFACE ELEV.:

COORDINATES:

NORTH:

EAST:

DATE START: 11/28/90

DATE COMPLETE: 11/30/90

WELL INSTALLATION: 11/30/90

PHYSICAL SETTING:

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	TIME	PID	O_2 / LEL
			Brownish well sorted V. Fine ~~grained~~ grained sand							1500	.2	20.9%
150			Tight!!! Very little water									
160			Pounding the casing has become futile - Tom P., the drillers, and									
170			I agreed to set well screen at this depth									

COMMENTS: 8" steel casing Down to 152.5'

: These soil descriptions and depths are approximate!

: BLIND DRILLING

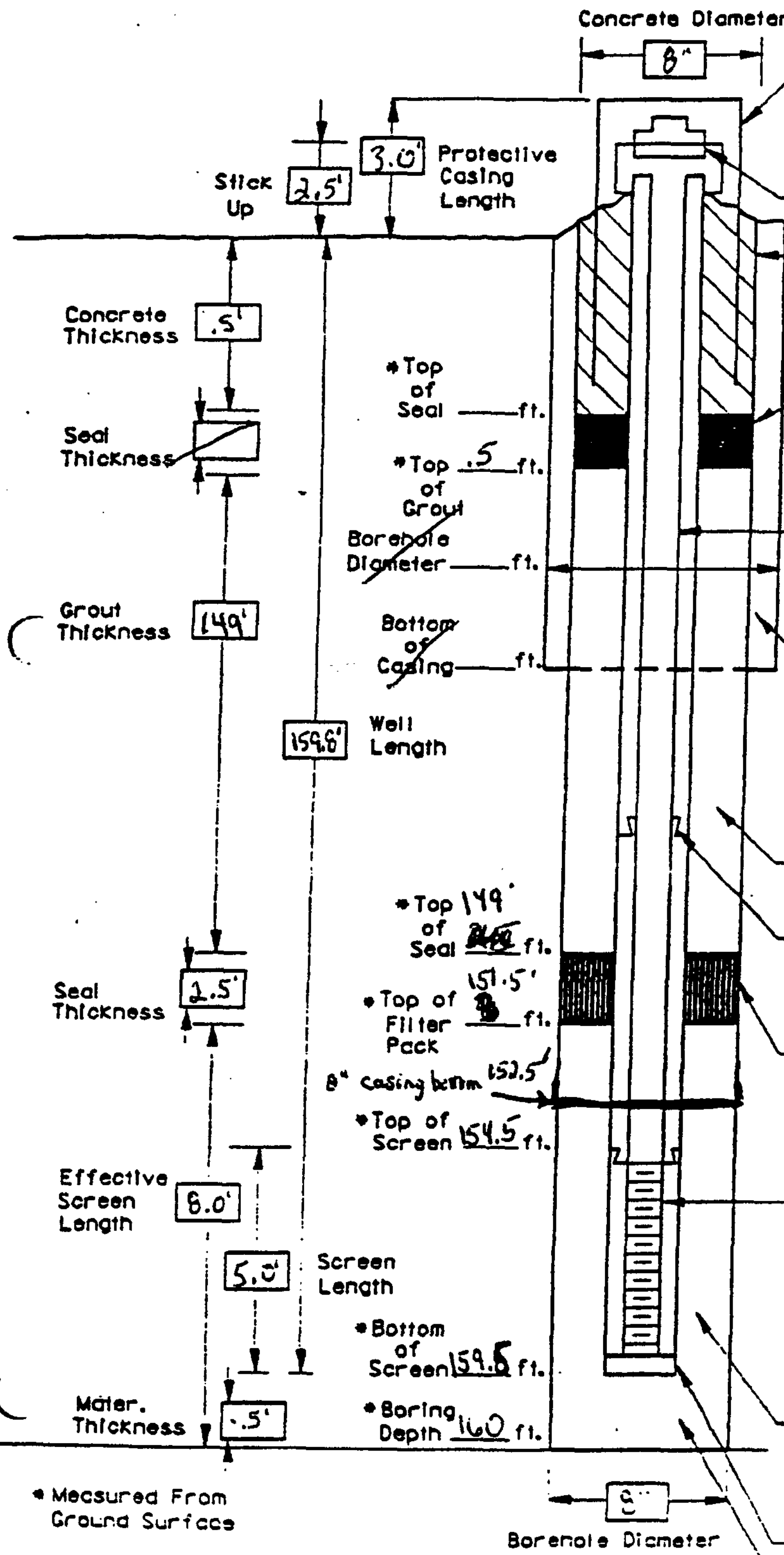
* 500 gallons of water put down well to hold formation back at 160'. However, most of this water exits out of the top of the 8" casing and does not enter the formation. SBP 12/16/90

Donohue Engineers & Architects
COMPUTER AIDED DESIGN/DRAFTING

DOUBLE CASING WELL/PIEZOMETER INSTALLATION DIAGRAM

Form

Site: Himco Dump Date: 12/1/90
Inspected By: S. Paderani Project No. 20026 Well No. P102C
Driller/Contractor Max Tinnea / Mathes



* Measured From Ground Surface

WATER SOURCE Elkart - Main St. Station water treatment

PROTECTIVE CASING **GUARD POSTS**
Type Steel Vented Yes/No Type Loose Fitted
Diameter 4" Locked Yes
Length 4' Key # 192-641

CAP OR PLUG Vented Yes/No Type ___

CONCRETE COLLAR
Cement .50 lbs.+Water .5 gal.
Total Quantity ___ gal
Manufacturer ___

UPPER SEAL
Powder/Granular/Pellets Quantity ___ gal
Hydrated ___ gal., Time ___
Manufacturer ___

PIPE Type Stainless Steel Schedule 5
O.D. 2 3/8" I.D. 2"
Length/Sec. 10ft/sec. No. Of Sec. 16 + 1/4 ab. gr.
Manufacturer Diedrich

GROUT Type ___
Mix ___ lbs. of ___ +
___ lbs. of ___ +
Water ___ gals. Total Quant. ___ gal.
Manufacturers ___

OUTSIDE GROUT Type Cement-bentonite grout - Volclay
AMOUNT 425 gal

JOINTS Flush Threaded Yes/No
Teflon Taped Yes/No O-Ring Yes/No
Manufacturer ___

LOWER SEAL
Powder/Pellets Quantity ~10 gal.
Hydrated ___ gal., Time ___
Manufacturer Lafarge

SCREEN
Type ~~...~~ steel Schedule 5
Length/Sec. 4.8 No. of Sec. 1
O.D. 2 1/4" I.D. 2"
Slot Size 10 No. Slots/ft. 180
Manufacturer Diedrich

FILTER PACK Type(s) Natural Material 160-154.5 w240
Source Ozark Mountains Volume ___ gal.
Manufacturer General Material

PLUG OR CAP Type Steel Length 1.5"

MATERIAL Fine Sand

Donohue
Engineers & Architects
COMPUTER AIDED DESIGN/DRAFTING

BORING LOG

SITE: RIMCO Dump PROJECT NO. 20026

SOIL BORING NO. B26-03

DRILLING METHOD: 4 1/4" ID HOLLOW STEM AUGERS (0.65' OD)
LOG BY: R CANNESTRA
DRILLER: D ELLIS
WEATHER: PTLY CLDY,

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING
11/11/90	11:30	4.1	17.0

PHYSICAL SETTING: ADJ TO POND BRUSH FIELD

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:
DATE START: 11/11/90
DATE COMPLETE: 11/11/90
WELL INSTALLATION: WT-103A

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS (BACKGROUND HNU 0.1 PPM)	B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	TIME	PID	O_2/LEL	H_2S/RAD
0	EOLIAN / OUTWASH	SW-GW	LOOSE 2.5Y 4/2, DK GRAYISH BROWN SAND (M-C) GRAINS QUARTZITIC, SUBANG TO SUBRND, PITTED, 10% SM-L GRAV. (SUBRND, DOLOMITIC) DAMP	9				SS-1 3"	0-2 / 0.1 IN SPOON	9:22	0.1	20.6/0	0/0
1.3			(3" BROWN SILTY SAND SOME ORGANICS, TOPSOIL)										
2	OUTWASH	SP	MD, 10YR 5/3 BROWN, SAND (MEDIUM, PITTED SUBANG-SUBRND QUARTZITIC GRAINS) TC F & C SAND TC SM-M GRAVEL (SUBANG-SUBRND DOLOMITIC) NON PLASTIC, NON COHESIVE, DAMP-MOIST (COLOR CHANGE & H_2O @ SPOON TIP)	15	19	15		SS-2 3"	2-4 / 0.1 IN SPOON	9:35	0.1	20.6/0	0/0
4	OUTWASH	SP	DENSE, 10YR 5/3 BROWN, SAND (MEDIUM SUBRND, PITTED, FROSTED, QUARTZITIC GRAINS) TC F & C SAND, TC SILT, NON PLASTIC SLIGHT COHESION SATURATED	45	17			SS-3 3"	4-6 / 0.1 IN SPOON	9:47	0.1	20.9/0	0/0
										DUPLICATE TAKEN (SOILS)			
6	OUTWASH	SP	DENSE, 10YR 5/2 BROWN SAND (MEDIUM SUBRND-RND, PITTED, FROSTED, QUARTZITIC GRAINS) TC F & C SAND, TC SM GRAV (DK BLACK SUBANG DOLOMITIC CLASTS) NON PLASTIC, NON COHESIVE, SATURATED	53	17			SS-4 3"	6-8 / 0.1 IN SPOON	9:57	0.1	20.9/0	0/0
8		SP	DENSE, 10YR 5/3, BROWN, SAND, (MEDIUM SUBANG-RND, PITTED, FROSTED, QUARTZITIC GRAINS) TC F & C SAND NON PLASTIC SLIGHT COHESION, SATURATED.	49	16			SS-5 3"	8-10 / 0.1 IN SPOON	10:20	0.1	20.5/0	0/0
9.3	OUTWASH	SW	AT 9.5 10YR 5/3 BROWN SAND F-C LAYER, TC SM GRAVEL, DOLOMITIC SOME FeO STAINING IN THIS LAYER										
10		SW	DENSE, 10YR 5/2, GRAYISH BROWN, SAND F-C, 12-15% GRAVEL (BROWN, BLACK SUBANG, DOLOMITIC CLASTS) NON-PLASTIC, NON COHESIVE, SATURATED	25	12			SS-6 3"	10-12 / 0.1 IN SPOON	10:33	0.1	20.9/0	0/0
12	OUTWASH	SW-GW	DENSE, 10YR 5/1, GRAY, SAND & GRAVEL SAND F-C, SUBANG-SUBRND FROSTED QUARTZITIC GRAINS, GRAVEL SM-M SUBANG, BUFF-BLK DOLOMITIC CLASTS TC SILT NON PLASTIC, NON COHESIVE SATURATED	51				SS-7 3"	12-14 / 0.1 IN SPOON	10:50	0.1	20.9/0	0/0
14			VERY DENSE, 10YR 5/1, GRAY, SAND & GRAVEL (SAND F-C, SUBRND-SUBANG, FROSTED	76				SS-8	14-16	11:00	0.1	20.6/0	0/0

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COMPUTER AIDED DESIGN/DRAFTING

BORING LOG

SOIL BORING NO. BRG-03

SITE: HIMCO DUMP PROJECT NO. 20026

DRILLING METHOD: 4 1/4" ID HOLLOW STEM AUGERS
LOG BY: B CANNESTRA
DRILLER: D. ELLIS
WEATHER: OVERCAST, NW BREEZE

WATER LEVEL READINGS: DATE / TIME / DEPTH / CASING

PHYSICAL SETTING: ADJACENT TO POND

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:
DATE START: 11/11/90
DATE COMPLETE: 11/11/90
WELL INSTALLATION: WT-103A

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	TIME	PID	O2/LEL
			TR SILT, NONPLASTIC, NON COHESIVE, FETID ODOR IN SAMPLE, SATURATED						SEE PREVIOUS PAGE			
16			BLIND DRILL TO 17.0' TO ALLOW EOS COLLAPSE DURING WELL INSTALL. NO SAMPLE TAKEN 16.0-17									
17			E.O.B. BRG-03 11/11/90 11:15									
			T.D. 17.0 FEET									
			B Cannestra									

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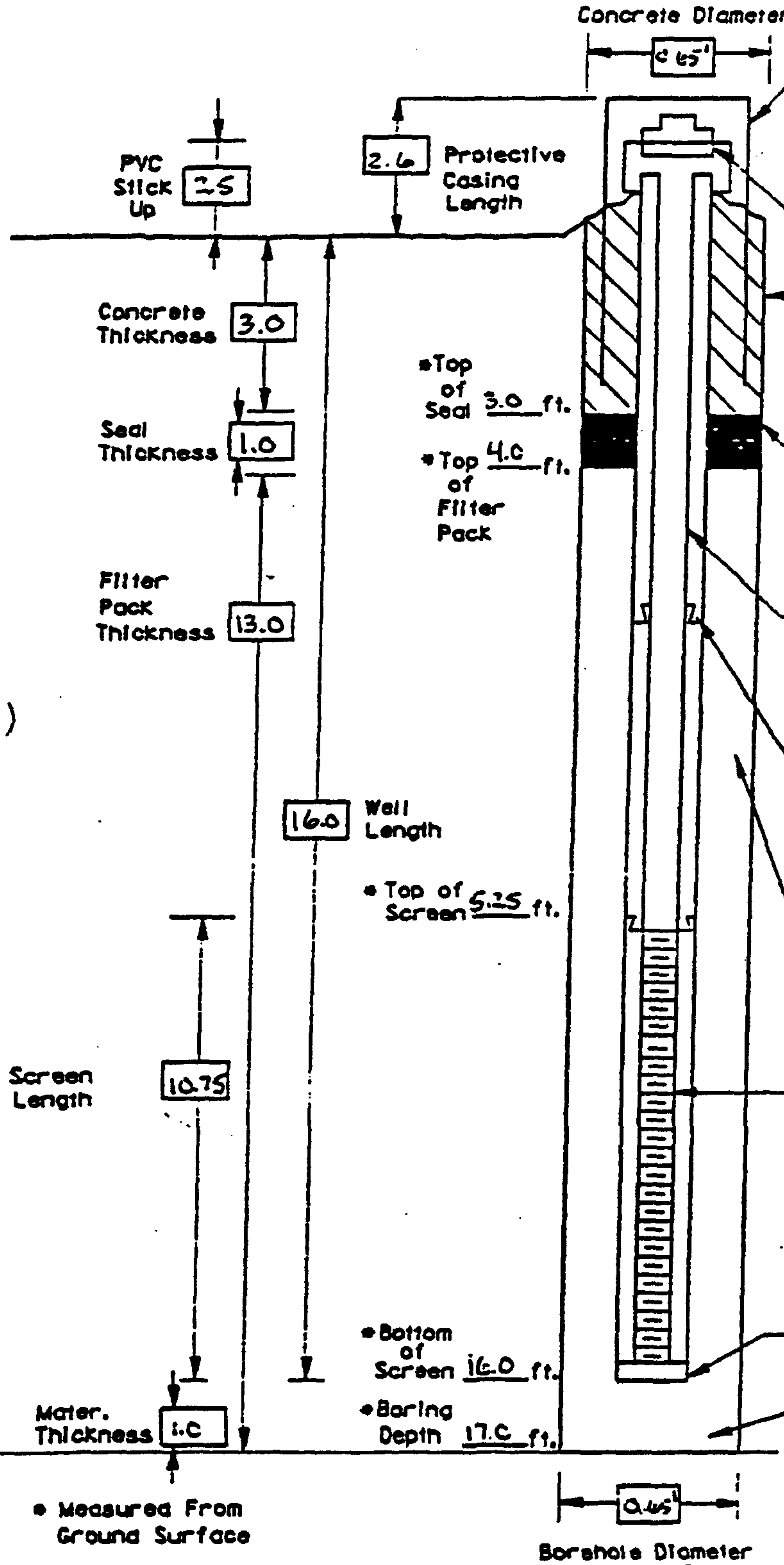
Water Table Well Installation Diagram

Form

Site: HIMCO DUMP Date: 11/11/90
Inspected By: R. CANNESTRA Project No. 20020 Well No. WT-103A
Driller/Contractor: D. ELLIS / MATHES



PROTECTIVE CASING

Type STEEL Vented (Yes)/No
Diameter 4" Locked YES MASTER
Length 5.6 Key # 2537

GUARD POSTS

Type NONE

CAP OR PLUG Vented (Yes)/No Type SLIP COUPLE / W/THREADED PLUG

CONCRETE COLLAR

Cement PRE-MIX lbs.+Water ____ gal.
Total Quantity ____ gal.
Manufacturer GENERAL CONTRACTORS ST LOUIS, MO

SEAL

Powder/Granular/(Pellets) 3/8 Quantity 3 GAL
Hydrated 2.5 gal., Time 12:08-14:
Manufacturer PELONITE by ROCKTEST

PIPE

Type FLUSH THREADED STAINLESS Schedule TYPE S GRADE 304
O.D. 2.0" I.D. 1.9"
Length/Sec. 10.0 No. Of Sec. PARTIAL
Manufacturer DIEDRICH

JOINTS Flush Threaded Yes/No ____
Teflon Taped Yes/No O-Ring Yes/No
Manufacturer ____

FILTER PACK Type(s) SILICA SAND

Source COLORADO SILICA SAND
Volume 2.5 100 LB BAGS & 18.5
Manufacturer COLORADO SILICA SAND COLORADO SPRINGS COLO.

SCREEN

Type CONTINUOUS WIRE WRAP STAINLESS Schedule TYPE S GRADE 304
Length/Sec. 5.3 No. of Sec. 2
O.D. 2.0" I.D. 1.9"
Slot Size 0.010 No. Slots/ft. ____
Manufacturers DEIDRICH

CAP OR PLUG Type STAINLESS THREADED PLUG Length 0.15

MATERIAL COLLAPSE & FILTER PACK

* Measured From Ground Surface

WATER SOURCE ELKHART MUNICIPAL WATER PLANT

Notes: ____

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BORING LOG

SOIL BORING NO. BRG-04

SITE: HIMCO DUMP   PROJECT NO. 20026

DRILLING METHOD: CME 55C
4 1/4" ID HOLLOW STEM AUGERS

LOG BY: Z CANVESTRA
DRILLER: D ELLIS
WEATHER: OVERCAST

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

BKGRND HNU READING 0 PPM
PHYSICAL SETTING: [illegible]

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:
DATE START: 11/11/90
DATE COMPLETE: 11/11/90
WELL INSTALLATION: WT-104A

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	B/N	R	SAMPLE TYPE	SAMPLE INTERVAL	TIME	PID	O_2 / LEL	CAP / H_2S
0	EOLIAN	OL-SM	LOOSE, 2.5Y 3/2 V DARK GRAYISH BROWN, SILTY SAND, F-M, ORGANICS, MOIST	9	18	SS-1, 3"	0'-2' (0.2 ppm IN SPOON)	16:00	0.2	20.9 / 0	
1	OUTWASH	SP	10YR 4/4 SAND (MEDIUM [illegible]) [illegible] MOIST								
2		SP	MEDIUM DENSE, 10YR 4/6, DARK YELLOWISH BROWN SAND (MEDIUM SUBANG-SUBRND F-M-GC, QUARTZITIC GRAINS) TR-SOME SILT TO F-M-C SAND TO GRAVEL (F-M, GRANS DOLOMITIC CLASTS), NONPLASTIC, SLIGHT COHESION, MOIST	[illegible]	16	SS-2, 3"	2'-4' (0.2 ppm IN SPOON)	16:07	0.2	20.9 / 0	0 / 0
4	OUTWASH	SP	MEDIUM DENSE MOTTLED 10YR 4/6 DK YELLOW BROWN & 10YR 7/3 VERY PALE BROWN SAND (F-M, SUBANG-SUBRND FROSTED QUARTZITIC GRAINS) TR CO SAND TR F-M DOLOMITIC GRAVEL (DK BROWN & TAN SUBANG CLASTS) TR SILT, NON PLASTIC, SLIGHT COHESION DAMP	15	17	SS-3, 3"	4'-6' (0.2 ppm IN SPOON)	16:26	0.2	20.9 / 0	0 / 0
6	OUTWASH	SP	MEDIUM DENSE 10YR 6/2 PALE BROWN SAND, (F-M, SUBANG-ANG, FROSTED, QUARTZITIC GRAINS) TR CO SAND, TR SILT TR ORGANIC FRAGMENTS TR F-M GRAVEL (SUBANG DOLO CLASTS) NON-PLASTIC, NON COHESIVE, DAMP-MOIST.	12	18	SS-4, 3"	6'-8' (0.2 ppm IN SPOON)	16:36	0.2	20.9 / 0	0 / 0
8		SP	LOOSE, 10YR 4/4 DARK YELLOWISH BROWN, SAND (F-M, SUBANG-ANG, FROSTED QUARTZITIC GRAINS) TR CO SAND, OCC F-M DOLOMITIC GRAVEL (SUBANG-SUBRND) NONPLASTIC NONCOHESIVE MOIST (WATER TABLE APPEARS ~ 8.8 FEET)	5	17	SS-5, 3"	8'-10' (0.2 ppm IN SPOON)	16:57	0.2	20.9 / 0	0 / 0
10	OUTWASH	SP	MEDIUM DENSE 10YR 5/3 BROWN SAND (F-M GRADING FINER TOWARDS BOTTOM OF SPOON GRAINS ARE SUBANG-ANG, QUARTZITIC) TR CO SAND, OCC F-M GRAVEL (DOLOMITIC GRANITIC SUBANG) NONPLASTIC, NON-COHESIVE, SATURATED	25	[illegible]	SS-6, 3"	10'-12' (0.2 ppm IN SPOON)	17:08	0.2	20.6 / 0	0 / 0
12	OUTWASH	SP	MED DENSE-DENSE 10YR 5/3 BROWN SAND (F-M, SUBANG-ANG, QUARTZITIC GRAINS) TR CO SAND [illegible] OF FeO2 STAINING @ 12.5' NONPLASTIC NONCOHESIVE, SATURATE	20	15	SS-7, 3"	12'-14' (0.2 ppm IN SPOON)	17:28	0.2	20.6 / 0	0 / 0
14			DENSE 10YR 5/3 [illegible] (F-M [illegible]) [illegible]	[illegible]		SS-8	14'-16'	17:37	0.2	20.6 / 0	0 / 0

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BORING LOG

SOIL BORING NO. BRG-Ø4

SITE: HIMCO DUMP PROJECT NO. 20026

DRILLING METHOD: 4 1/4" ID HOLLOW STEM AUGERS

LOG BY: R. CANNESTRA

DRILLER: D. ELLIS

WEATHER: OVERCAST, NW WIND, 45

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING: LEVEL GRASS

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:
DATE START: 11/11/90
DATE COMPLETE: 11/11/90
WELL INSTALLATION: WT-104A

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	B	N	A	R	SAMPLE TYPE / INTERVAL	TIME	PID	O2/LEL
		SP	YELLOW BROWN, NON PLASTIC, NONCOHESIVE, SATURATED					SEE PREVIOUS SHEET			
16			NO SAMPLE TAKEN 16.0-17.0 FT. BORING ADVANCED TO 17.0 BY BLIND DRILL TO ACCOMMODATE "SLUFF" IN BOREHOLE FOR WELL INSTALLATION								
			END OF BORING BRG-Ø4 11/11/90 17:45								
			Rodg Cannestra								

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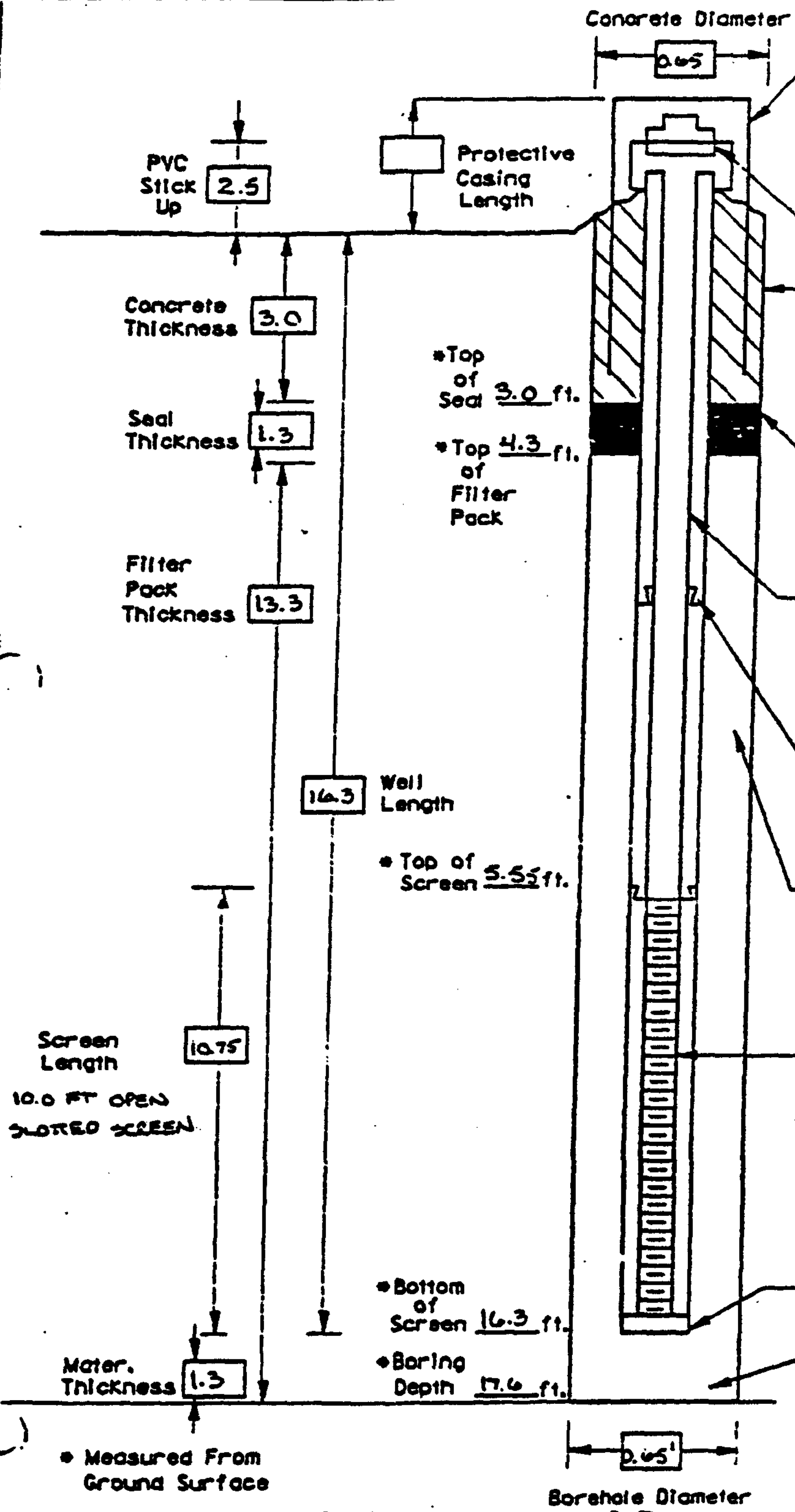
Water Table Well Installation Diagram

Form

Site: HIMCO DUMP SITE Date: 11/12/90

Inspected By: R. CANNESTRA Project No. 20026.023 Well No. WT-104A

Driller/Contractor D ELLIS / MATHES



PROTECTIVE CASING **GUARD POSTS**

Type STEEL Vented (Yes)/No Type LOOSE FITTING (?)

Diameter 4" Locked YES, MASTER

Length 5.6' Key # 2532

CAP OR PLUG Vented (Yes)/No Type SLIP CAP (PVC W/ THREADED PLUG)

CONCRETE COLLAR

Cement PALMIX lbs.+Water ______ gal.______

Total Quantity ______ gal.______

Manufacturer PALMIX

SEAL

Powder/Granular/(Pellets) 3/8" Quantity 3.0

Hydrated 2.0 gal., Time 9:50-11:15

Manufacturer PELONITE by ROCTEST

PIPE Type FLUSH THREAD STAINLESS Schedule TYPE 5 ...

O.D. 2.0" I.D. 1.9

Length/Sec. 10.0 No. Of Sec. PARTIAL

Manufacturer DIEDRICH

JOINTS Flush Threaded (Yes)/No

Teflon Taped (Yes)/No O-Ring Yes/(No)

Manufacturer ACE HARDWARE

FILTER PACK Type(s) GRADE 10/20 SILICA SAND

Source COLORADO SILICA SAND

Volume 3.5 100lb BAGS 24.0

Manufacturer COLORADO SILICA SAND, INC. P.O. BOX 15615 COLORADO SPRINGS, CO

SCREEN

Type CONTINUOUS WIRE WRAP - STAINLESS Schedule TYPE 5/304

*Length/Sec. 5.3 No. of Sec. 2

O.D. 2.0" I.D. 1.9

Slot Size 0.010 No. Slots/ft. ______

Manufacturers DIEDRICH

CAP OR PLUG Type STAINLESS THREADED PLUG Length 0.15'

MATERIAL COLLAPSE & FILTER PACK

* Measured From Ground Surface

WATER SOURCE ELKHART MUNICIPAL WATER PLANT

Notes: WATER LEVEL 9.9 FT ... ...

* 10.0 FT OPEN SCREEN ... COMPLETION ... 12.5 ...

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COMPUTER AIDED DESIGN/DRAFTING

BORING LOG

SITE: HIMCO DUMP SUPERFUND PROJECT NO. 20026

SOIL BORING NO. BRG-05

DRILLING METHOD: CME 550
4 1/4 IN ID (8 1/2 IN OD)
HOLLOW STEM AUGER
LOG BY: R. CANNESTRA
DRILLER: DAVE ELLIS
WEATHER: OVERCAST

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING: ADJACENT TILLED FIELD

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:
DATE START: 11-9-90
DATE COMPLETE:
WELL INSTALLATION:

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	TIME	PID	O_2 / LEL	GEIGER
										BACKGROUND PID 0.4 (AIR MONITORING)			
0–1		OL	MD, 10YR 3/2 VD GRAYISH BROWN SILTY ORGANIC SAND, [illegible] SILT, TR ORGANICS, OCC SM–LG [illegible], DOLOMITIC GRAVEL, MOIST	13				SS-1 / 3"	0-2 / 0.5	15:33 / 0.5	0.4	20.6 / 0	0
1–2	OUTWASH	[illegible]	MD, 10YR 4/6 DK YELLOWISH BROWN SAND, F-M, TR–SOME SILT, TR C. SAND, TR [illegible] GRAVEL, TR ORGANICS, MOIST		19								
2–4	OUTWASH	SP	MD, 10YR 4/6 DK YELLOWISH BROWN SAND, F-M, TR SILT, TR CO SAND, TR SM–LG [illegible], F.D. [illegible], MOIST	12	20			SS-2 / 3"	2-4 / 0.6	15:25 / 0.6	0.4	20.6 / 0	0
4–6		SP	MD 10YR 4/6 DK YELLOWISH BROWN SAND, F-M, TR SILT, OCC SM–M [illegible] [illegible] GRAVEL, TR CO SAND, MOIST	21	21			SS-3 / 3"	4-6 / 0.7	15:35 / 0.7	0.5	20.6 / 0	0
6–8		SP	MD 10YR 4/6 DK YELLOWISH BROWN SAND, F-M, TR SILT, TR CO SAND, TR SM [illegible] RND GRAVEL DOLOMITIC, TR DK BLACK GRAINS @ ZONE OF PID HIT 3.5 HIT ALSO AT APPARENT W.T. ~7.5'	12	19			SS-4 / 3"	6-8 / 1.6	15:45 / 1.6	0.4	20.6 / 0	0
8–10		SW-SP	MD 10YR 5/2 BROWN SAND, F-C, TR SILT, TR SM GRAVEL, DOLOMITIC, SAMPLE PID 2.0 [illegible] ABOVE BKGND, SATURATED	29	15			SS-5 / 3"	8-10 / 2.0	16:00	0.6 / 4.6 BOREHOLE	20.6 / 0	0
10–12	OUTWASH	SP	MD 10YR 5/2 BROWN, SAND MEDIUM, TR SILT, TR SM GRAVEL, DOLOMITIC, OCC BLACK GRAINS, [illegible] [illegible] FAINTLY [illegible] [illegible] [illegible] SATURATED	25	15			SS-6 / 3"	10-12 / 3.4	16:25	1.2 / 5.0	20.6 / 0	0
12–14	OUTWASH	SP	VD, 10YR 5/2, BROWN SAND MEDIUM, TR SILT, TR GRAVEL, DOLOMITE, SUB ANG, OCC [illegible] BLACK GRAINS, SATURATED	67				SS-7 / 3"	12-14 / 20.0+	16:40	BZ 0.9 / BH 4.4	20.6 / 0.3	0
14–	OUTWASH	SP	VD 10YR 5/2 BROWN SAND [illegible]	60				SS-8	14-16	17:0	BZ 0.6	20.6 / 0	0

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BORING LOG

SOIL BORING NO. BRG-05

SITE: NIMCO DUMP SUPER FUND PROJECT NO. 20026

DRILLING METHOD: CME 550
4 1/4 IN ID (8 1/2 IN OD)
HOLLOW STEM AUGER
LOG BY: R. CANNESTRA
DRILLER: D ELLIS (MATHES)
WEATHER: OVERCAST

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING:

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:
DATE START: 11-
DATE COMPLETE:
WELL INSTALLATION:

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	B	N	A	R	SAMPLE TYPE / INTERVAL	TIME	PID	O2 / LEL
		SP						SS-3			
			END OF BORING BRG 05								
			TD 16.0								

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Water Table Well Installation Diagram

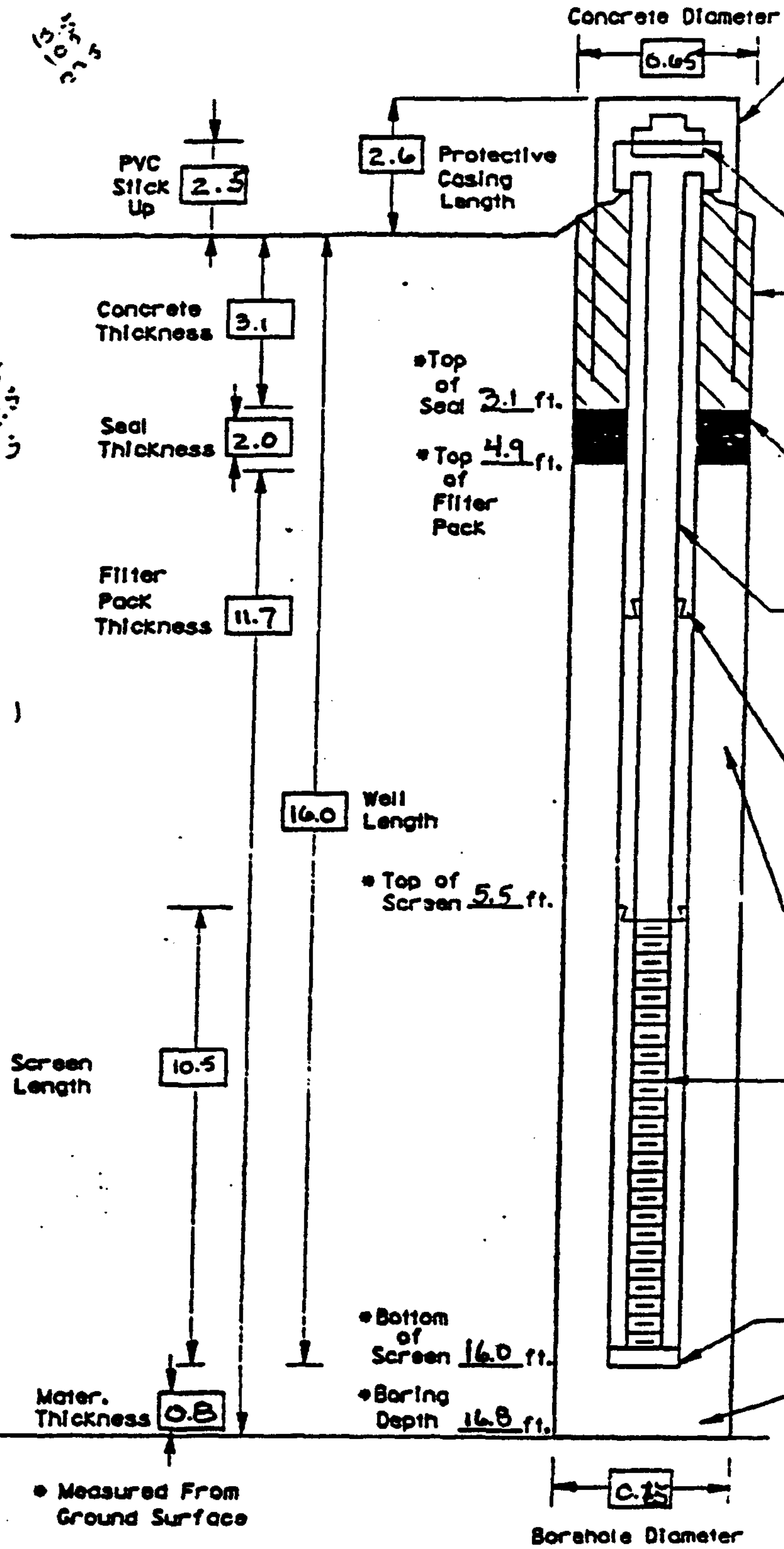
Form ...

Site: HIMCO DUMP Date: 11/10/90

Inspected By: R. CANNESTRA Project No. 20026 Well No. WT-105A

R Cannestra

Driller/Contractor D. ELLIS/MATHES



PROTECTIVE CASING **GUARD POSTS**

Type STEEL Vented (Yes)/No Type LOOSE COVER

Diameter 4" Locked MASTER

Length 5.6' Key # 2532

CAP OR PLUG Vented (Yes)/No Type PVC THREAD SLIP CAP & PLUG

CONCRETE COLLAR

Cement PREMIXED lbs.+Water VARIABLE gal.

Total Quantity 3 BAGS gal. ±15

Manufacturer GENERAL MATERIALS, ST. LOUIS

SEAL

Powder/Granular/(Pellets) Quantity 5 gal ga

Hydrated 2.5 gal., Time 9:15 - 9:42

Manufacturer PELONITE by Rocktest INC

PIPE Type STAINLESS Schedule

O.D. " I.D.

Length/Sec. 10.1 No. Of Sec. PART 1A

Manufacturer DIEDRICH

JOINTS Flush Threaded (Yes)/No

Teflon Taped (Yes)/No O-Ring Yes/(No)

Manufacturer ACE HARDWARE

FILTER PACK Type(s) SILICA SAND #10-20

Source COLORADO SILICA SAND, COLORADO SPS

Volume 20 gal 2 and 5/6 bags ga

Manufacturer COLORADO SILICA SAND

SCREEN

CONTINUOUS WRAP

Type STAINLESS Schedule

Length/Sec. 5. No. of Sec. 2

O.D. " I.D.

Slot Size 0.01 No. Slots/ft.

Manufacturers DIEDRICH

CAP OR PLUG Type STAINLESS Length 0.1

MATERIAL COLLAPSE & SILICA SAND

WATER SOURCE

Notes: WATER @ 7.5' THRU AUGERS

SEAL HYDRATED 25-30 MIN BEFORE PLACING CONCRETE CAP

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BORING LOG

SOIL BORING NO. BRG-6

SITE: [illegible] PROJECT NO. 20026

DRILLING METHOD: HOLLOW STEM AUGER

LOG BY: R. [illegible]

DRILLER: J. ELLIS

WEATHER: OVERCAST

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING
11-9	9:40	7.0'	16.0'

PHYSICAL SETTING: GRASS

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:
DATE START: 11-08-90
DATE COMPLETE: 11-08-90
WELL INSTALLATION: YES

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	TIME	PID	O_2 / LEL	GIGGER
		OL	LOOSE, 10YR4/2 DARK GRAY[illegible] BROWN SILTY SAND F-M, QUARTZITIC, TR ORGANICS, [illegible]	6				SS-1 3"	0-2' 0.2 ppm	15:25	0.2	20.9 %	0
	OUTWASH	SP-SW	LOOSE 10YR 5/[illegible] YELLOWISH BROWN SAND M-C MOSTLY MEDIUM, TR SM-L SUB RND GRAVEL MOIST	1"									
		SP	DENSE 10YR 5/[illegible] YELLOWISH BROWN SAND M-C, TR SM-M SUBANG TO SUBRND, SOME LIMONITE STAINING MOIST, CHANGES COLOR @ 3.2 FT TO 10YR 6/2 LT BROWNISH GRAY SOME MOTTLING	19			18	SS-2 3"	2-4 0.2 ppm	15:38	0.2	20.9 %	0
5	OUTWASH		DENSE, 10YR 6/6 BROWNISH YELLOW, SAND MEDIUM, TR F&C sand, OCC SM-M SUBRND DOLOMITIC GRAVEL, OCC 1-2 mm LAMINATIONS MOIST	13				SS-3 3"	4-6 0.3 ppm	15:58	0.2	20.9 %	0
		SP	DENSE 10YR 5/4 YELLOWISH BROWN, SAND MEDIUM, TR F-Co SAND OCCASIONAL RND-SUB RND DOLO GRAVEL SM-M MOIST W/L @ 7.3'	18				SS-4 3"	6-8 0.8 ppm	16:18	0.2	20.9 %	0
	OUTWASH	SP	DENSE 10YR 5/3, BROWN, SAND, M-Co, Co SAND SEAM 1-2" @ 8.4 FT, TR SILT, OCC SM DOLO GRAVEL (SUB RND - SUBANG) WET & SATURATED	28			19	SS-5 3"	8-10 0.2 ppm	16:38	0.2	20.9 %	0
10	OUT WASH	SP-SW	DENSE 10YR 5/3 BROWN, SAND, F-Co GRAV SEAM 2" @ 10.9' TR SILT SAND [illegible] FINER NEAR TOP [illegible] SM-L SUBANG-SUB RND DOLOMITE	44				SS-6 3"	10-12 0.2 ppm	16:54	0.2	20.9 %	0
		SP-GP	DENSE-VD 10YR 5/1 [illegible] M SAND & GRAVEL [illegible] & [illegible] SOLVENT ODOR SATURATED, OCC BLACK [illegible]	33				SS-7 3"	12-14 0.2 ppm	17:20	0.2	20.9 %	0
		SP GP	DENSE 10YR 5/1 [illegible] SAND [illegible] GRAVEL [illegible] F-M SAND, GRAVEL SUBANG-SUBRND, SOLVENT ODOR SAT	18				SS-8	14-16	17:30	0.2	20.9 %	0

BEHP

SHEET 2 OF 2

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BORING LOG

SITE: ~M.C.D. ~UNF   PROJECT NO. 2CC

SOIL BORING NO. BRG-6

DRILLING METHOD: HOLLOW STEM AUGER

LOG BY: R CARRASTRA

DRILLER: D. ELLIS

WEATHER: CLEAR & COOL

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING:

GROUND SURFACE ELEV.:

COORDINATES:

NORTH:

EAST:

DATE START: 11-08-90

DATE COMPLETE: 11-08-90

WELL INSTALLATION:

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	TIME	PID	O2/LEL
		SP-GP	SEE PAGE 1									
			END OF BORING AT 16.0'									
			11/08/90 RBC									

Sheet 1 of 1

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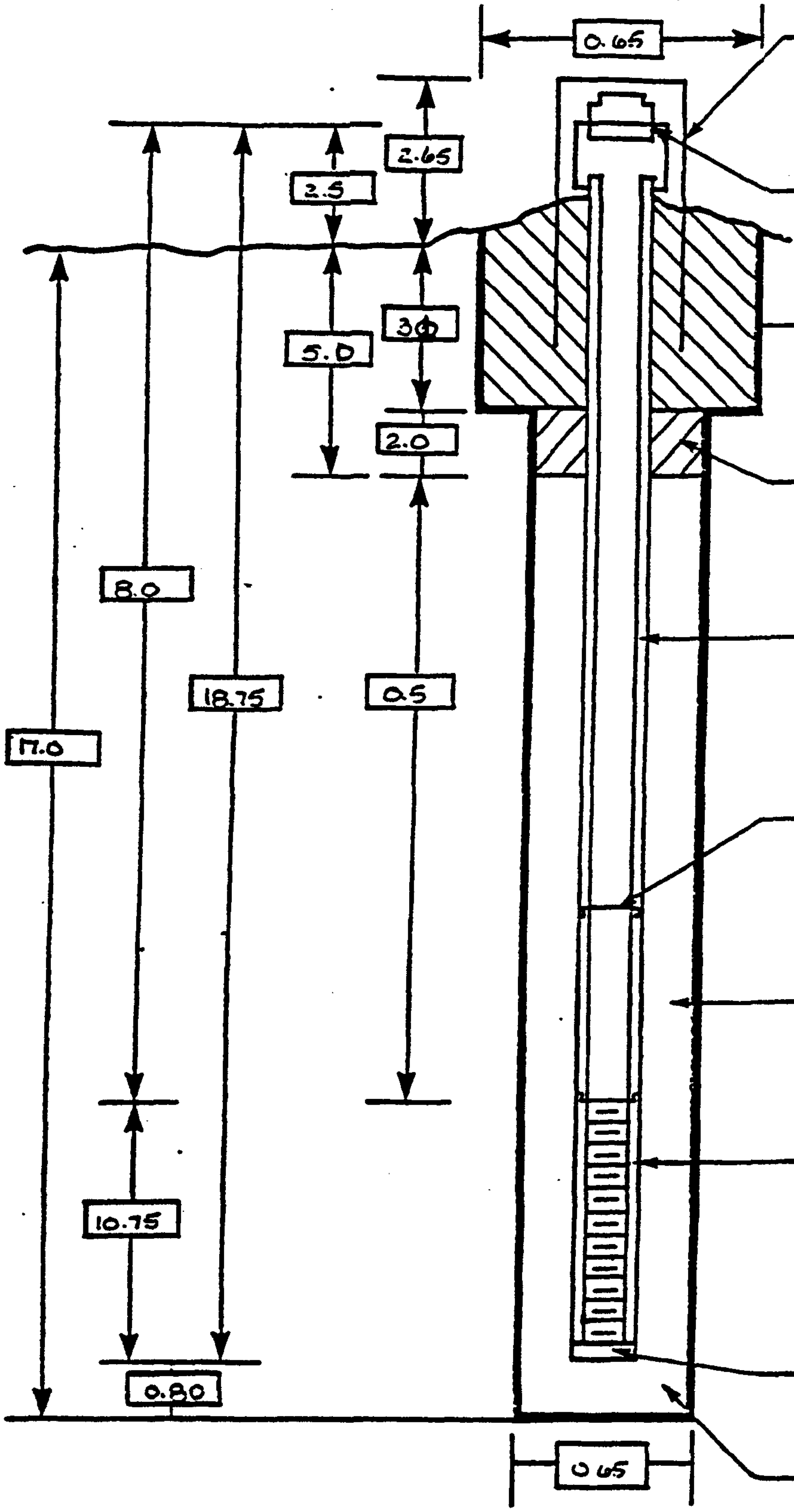
OBSERVATION WELL INSTALLATION DIAGRAM

Well No. WT 106A

Site: HIMCO DUMP, ELKHART, IN Date: NOVEMBER 9, 1990

By: R. CANNESTRA / MATHES Project No. 20026.023



Protective Casing

Type STEEL Vented ✓ Locked YES, MASTER
Diameter 4"
Length 5.6 Key # 3532

Guard Posts

Type STEEL ?

Plug

Type SLIP COUPLING W/ THREADED PLUG
Vented YES

Concrete Collar PREMIXED

~~Quant. Cement~~ MIXTURE 160 lbs. + Quant. Water ___ gal.
Total Quant. 5.0 gal.
Manufacturer PREEMIX, GENERAL CONTR. ST LOUIS MO

Seal

Powder/Granular/Pellets 3/8 Quant. 5.0 gal.
Manufacturer PELONITE by ROCTEST
Hydrated 2.5 gal., Time 11:01 – 11:30

Pipe

Type FLUSH THREADED STAINLESS STEEL
O.D. 2.0" Manufacturer DIEDRICH
I.D. 1.9" Schedule TYPE 5 #304
Length/per sec. 10.0 No. of sec. PARTIAL

Joints

Threaded Flush Joint YES
Teflon Taped Yes/No
Tape TEFLON
Manufacturer ACE HARDWARE

Backfill

Type(s) SILICA SAND #10-20
Source COLORADO SILICA SAND, COLO. SPGS
Volume

Screen

Type CONTINUOUS WIRE WRAP SS Slot Size 0.010
O.D. 2.0" No. Slots/ft.
I.D. 1.9" Schedule TYPE 5 #304
Manufacturer DIEDRICH
Length/per sec. 5.3 No. of sec. 2

Cap

Type THREADED STAINLESS STEEL PLUG (0.15' LENGTH)

Material

COLLAPSE & FILTER PACK

Notes: Water Source ELKHART MUNICIPAL WATER WORKS
WATER LEVEL IN BOREHOLE PRIOR TO INSTALLATION ~7.0 BELOW G.S.

Donohue

Engineers & Architects

BORING LOG

SOIL BORING NO. GT-11

SITE: Hmsc/eutern PROJECT NO. 20023

DRILLING METHOD:	Hollow Stem - 3¼"
FOREMAN:	Denny Goodwin
ASSISTANT:	Jim Becker
GEOL./ENG'R:	S. Patevan
LOG BY:	S Patevan

WATER LEVEL READINGS

DATE	TIME	DEPTH	
			W.D.
			S.C.R.
			A.C.R.
			HRS. A.D.
			HRS. A.D.

GROUND SURFACE ELEV. ____
PHYSICAL SETTING: flat field
DATE START: 9/14/91
DATE COMPLETE: ~~9/14/~~ 9/14/91

DEPTH IN FEET	SAMPLING DATA NO.	T	USCS	SOIL DESCRIPTION	COMMENTS
0–2	[illegible]	9	SP	3 [illegible] dark brown poorly graded [illegible] ~~[illegible]~~ [illegible]; 7.5 [illegible] strong brown poorly graded medium to coarse grained sand with one large piece of gravel	[illegible]; + moist
5–7	7/16, 11/13	[illegible]	SW	5/4 (2.5Y) reddish brown well graded medium to coarse grained sand	+ moist
10–12	6/7, 6/9	8	SP	5/4 (10YR) yellowish brown poorly graded medium grained sand with a ~~few~~ scattered pieces of large to medium sized gravel	+ moist
13				WT	
15–17	3/3, 4/4	7	SP	5/4 (10YR) yellowish brown poorly graded medium grained sand with scattered medium ~~grain~~ to coarse grained gravel	Saturated; Sample not retained

Donohue

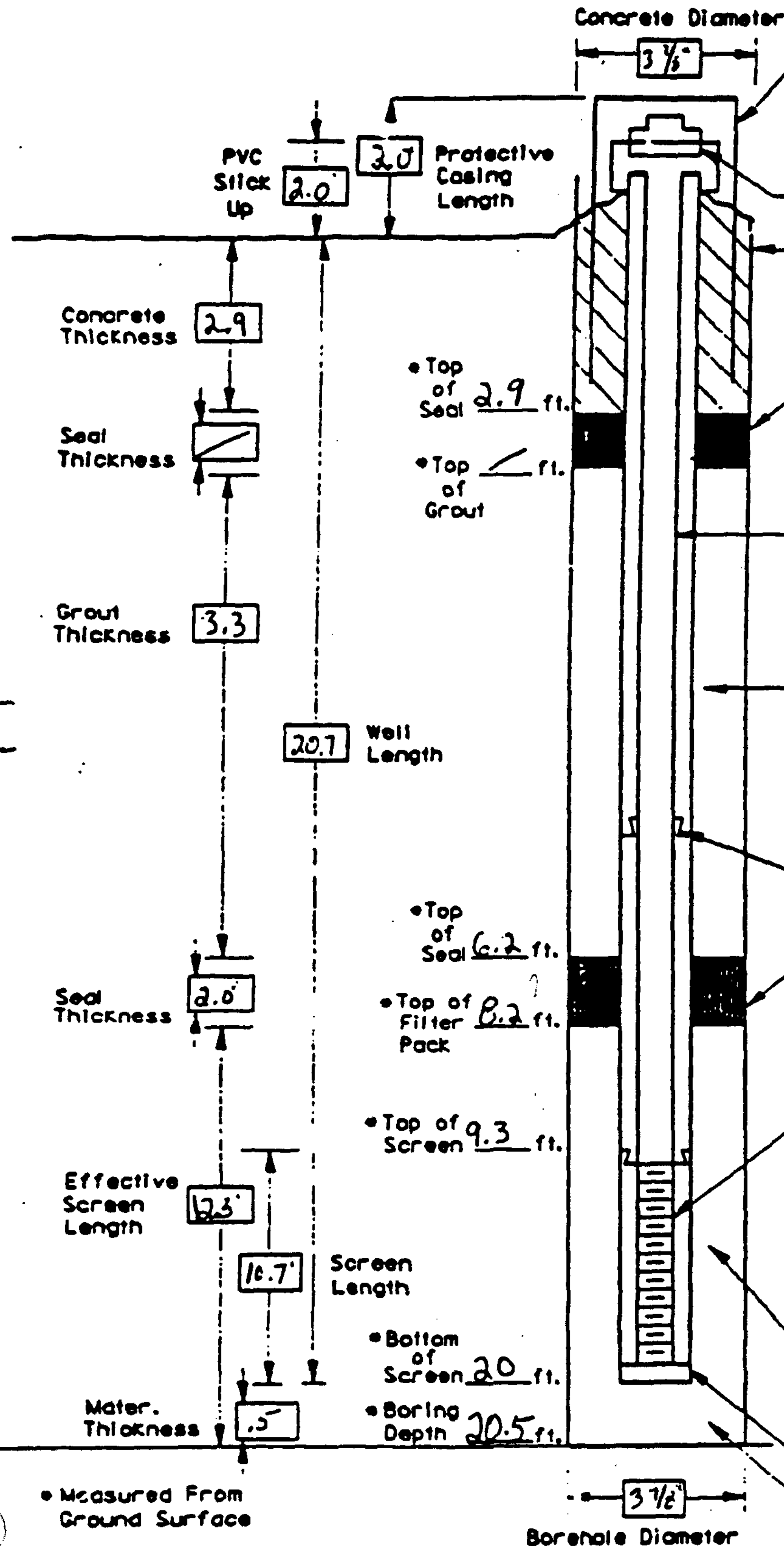
Engineers & Architects

Water Table Well Installation Diagram

Site: Himco Date: 9/10/91

Inspected By: ____ Project No. 20023 **Well No. WT111A**

Driller/Contractor Mathes



PROTECTIVE CASING
Type Steel Vented (Yes)/No
Diameter 4" Locked Yes
Length 4' Key # 2532

GUARD POSTS
Type Steel-

CAP/ OR PLUG Vented (Yes)/~~No~~ Type PVC

CONCRETE COLLAR
Cement 20 lbs.+Water 5 gal.
Total Quantity 5
Manufacturer

UPPER SEAL
Powder/Granular/Pellets Quantity
Hydrated ____ gal., Time
Manufacturer

PIPE Type Stainless Steel Schedule 40
O.D. 2 ⅜" I.D. 2"
Length/Sec. 10' No. Of Sec. 1 + 2.0' of top
Manufacturer

GROUT Type Bentonite cement
Mix 12 lbs. of bentonite +
____ lbs. of +
Water 30 gals. Total Quant. 15 ga
Manufacturers

JOINTS Flush Threaded (Yes)/No
Teflon Taped (Yes)/No O-Ring Yes/(No)
Manufacturer

LOWER SEAL
Powder/(Pellets) Quantity 5 ga
(Hydrated) ≈ 5 gal., Time 1430
Manufacturer

SCREEN
Type Stainless steel Schedule 40
Length/Sec. 5' No. of Sec. 2
O.D. 2 ⅜" I.D. 2"
Slot Size 0.010-inch No. Slots/ft.
Manufacturer

FILTER PACK Type(s) No. 50 sand
Source Colorado Volume 3.5 gal
Manufacturer CSSI

PLUG OR CAP Type Stainless Length .10'

MATERIAL SP Poorly graded sand

WATER SOURCE Main Street ~~well~~ #

Notes: Protective Casing vent hole near ground surface

HTW DRILLING LOG

HOLE NO.	WT112A
1. COMPANY NAME	U.S. ARMY CORPS OF ENGINEERS
2. DRILLING SUBCONTRACTOR	N/A
SHEET 1 OF 3 SHEETS	
3. PROJECT	HIMCO DUMP SUPERFUND SITE
4. LOCATION	ELKHART, IN.
5. NAME OF DRILLER	JOE MORRISSEY
6. MANUFACTURER'S DESIGNATION OF DRILL	GUS PECH 1100C
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	4 1/4" I.D. HSA; 2" O.D. CARBON STEEL SPLIT SPOON SAMPLER DRIVEN BY A 140 POUND HAMMER FOR SPT; HNU PI101 PID; ISTMX 410 CGI.
8. HOLE LOCATION	
9. SURFACE ELEVATION	
10. DATE STARTED	8-23-95
11. DATE COMPLETED	8-23-95
12. OVERBURDEN THICKNESS	UNKNOWN
15. DEPTH GROUNDWATER ENCOUNTERED	9.5'
13. DEPTH DRILLED INTO ROCK	N/A
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	8-24-95 9:56 AM 8.5'
14. TOTAL DEPTH OF HOLE	16.0'
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	1		

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
						%

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		2" PVC		MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO. e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	0		BACKGROUND HNU = 2.8 UNITS O_2 = 20.9% LEL = 0%				
	1						
	2						
	3						
		POORLY GRADED SAND (SP): MEDIUM DENSE, MOIST, TAN, MEDIUM TO COARSE SAND, OUTWASH DEPOSITS.	BREATHING ZONE HNU = 3.3 UNITS O_2 = 20.8% LEL = 0%			4	N = 12 REC. = 1.5'
	4					5	
	5					7	

HTW DRILLING LOG

HOLE NO.	WT112A
PROJECT	HIMCO DUMP SUPERFUND SITE
INSPECTOR	MICHELLE BENAK
SHEET	2 OF 3 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	6						
	7						
	8						
		WELL GRADED GRAVEL WITH SAND (GW): MEDIUM DENSE, MOIST, TAN, 20% MEDIUM TO COARSE SAND, OUTWASH DEPOSITS.	BREATHING ZONE HNU = 3.0 UNITS O_2 = 20.9% LEL = 0%			4	N = 16 REC. = 1.4'
	9					7	10:07 AM WATER @ 9.5'
▽						9	
	10						
	11						
	12						
	13						
		WELL GRADED SAND WITH GRAVEL (SW): WET, BROWN, 15%-20% GRAVEL, OUTWASH DEPOSITS.	BREATHING ZONE HNU = 3.0 UNITS O_2 = 20.9% LEL = 0%	D-1		13	N = 127 REC. = 1.5'
	14					67	

HTW DRILLING LOG

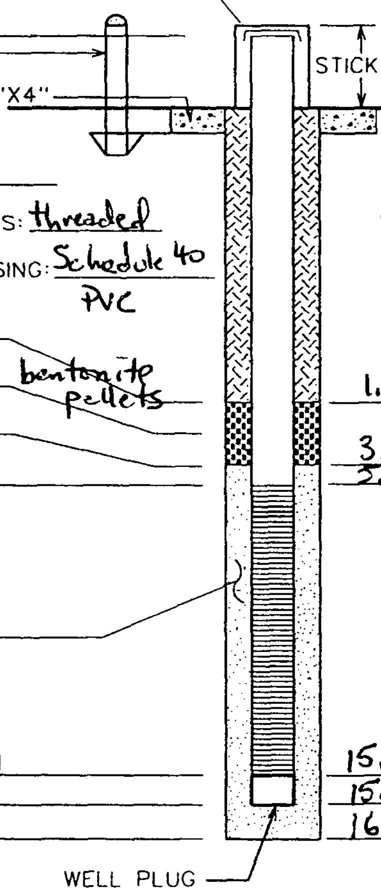
HOLE NO.	SHEET	PROJECT	INSPECTOR
WT112A	3 OF 3 SHEETS	HIMCO DUMP SUPERFUND SITE	MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
			D-1			60	SPLIT SPOON SAMPLER WAS FULL, POSSIBLY CAUSING ARTIFICIALLY HIGH BLOW COUNTS.
	15						
	16						
		BOTTOM OF HOLE @ 16.0'					
	17						

ELEVATION GROUND WATER			PROJECT Himco Dump Superfund Site
DATE INSTALLED	STARTED 8-23-95	COMPLETED 8-24-95	LOCATION (Coordinates or Station) N. 1533653.49 E. 406824.67
ELEVATION TOP OF HOLE Riser - 765.90 Ground - 763.6			SIGNATURE OF INSPECTOR Michelle Benak
TOTAL DEPTH OF HOLE 16.0 ft.			HOLE NO. WT112A

MONITORING WELL CONSTRUCTION DIAGRAM

(ALL MEASUREMENTS FROM GROUND SURFACE)



PROTECTIVE CASING

TYPE OF PROTECTIVE CASING: 4-inch square steel w/ hinged locking cap

TOP OF WELL

PROTECTIVE POSTS

CONCRETE PAD 4'X4'X4"

STICK-UP 2.3 ft. GROUND SURFACE

CASING DIAMETER: 2 in.

TYPE OF PIPE JOINTS: threaded

TYPE OF BLANK CASING: Schedule 40 PVC

LENGTH OF SOLID PIPE 7.7 ft.

TOP OF SEAL 1.5 ft.

TYPE OF SEAL: 3/8" bentonite pellets

TOP OF FILTERPACK 3.9 ft.

TOP OF SCREEN 5.4 ft.

WELL SCREEN LENGTH 10 ft.

FILTERPACK

BOTTOM OF SCREEN 15.4 ft.

BOTTOM OF WELL 15.6 ft.

BOTTOM OF BORING 16.0 ft.

WELL PLUG

SCREEN INFORMATION

SCREEN DIA.: 2 in.

SLOT WIDTH: 0.020 in.

SCHEDULE: 40

MATERIAL: ☒ PVC ☐ STAINLESS STEEL ☐ OTHER (DESCRIBE)

FILTERPACK MATERIAL

TYPE: 16-30 Colorado Silica

BACKFILL METHOD: Poured down annular space between riser and augers.

WATER LEVEL SUMMARY

WATER LEVEL MEASUREMENTS

DATE/TIME/LEVEL 8-23-95 10:07am 9.5ft.

8-24-95 9:56AM 8.5ft.

HTW DRILLING LOG

1. COMPANY NAME U.S. ARMY CORPS OF ENGINEERS	2. DRILLING SUBCONTRACTOR N/A	HOLE NO. WT112B SHEET 1 OF 7 SHEETS
3. PROJECT HIMCO DUMP SUPERFUND SITE	4. LOCATION ELKHART, IN.	
5. NAME OF DRILLER JOE MORRISSEY	6. MANUFACTURER'S DESIGNATION OF DRILL GUS PECH 1100C	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT 6¹/₄" I.D. HSA; 2" O.D. CARBON STEEL SPLIT SPOON SAMPLER DRIVEN BY A 140 POUND HAMMER FOR SPT; HNU P1101 PID; ISTMX 410 CGI.	8. HOLE LOCATION 9. SURFACE ELEVATION 10. DATE STARTED 8-23-95 11. DATE COMPLETED 8-23-95	
12. OVERBURDEN THICKNESS UNKNOWN	15. DEPTH GROUNDWATER ENCOUNTERED SEE LOG OF WT112A	
13. DEPTH DRILLED INTO ROCK N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED 8-24-95 9:58AM 8.8'	
14. TOTAL DEPTH OF HOLE 59.3'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	1		

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
						%

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		2" PVC		MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO. e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	0	SEE LOG OF BORING FOR WT112A FOR A DESCRIPTION OF MATERIALS DOWN TO 15' BELOW GROUND SURFACE.	BACKGROUND HNU = 2.8 UNITS O_2 = 20.9% LEL = 0%				AUGERED TO 18.5' AND OBTAINED FIRST SAMPLE FROM 18.5'-20.0' AND EVERY 5' THEREAFTER
	1						
	2						
	3						
	4						
	5						

HTW DRILLING LOG

HOLE NO.
WT112B

PROJECT	INSPECTOR	SHEET 2
HIMCO DUMP SUPERFUND SITE	MICHELLE BENAK	OF 7 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	6						
	7						
	8						
	9						
	10						
	11						
	12						
	13						
	14						

HTW DRILLING LOG

HOLE NO.	WT112B
PROJECT	HIMCO DUMP SUPERFUND SITE
INSPECTOR	MICHELLE BENAK
SHEET	3 OF 7 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	15						
	16						
	17						
	18						
		WELL GRADED GRAVEL (GW): WET, BROWN TO LIGHT BROWN, FINE TO COARSE GRAVEL, OUTWASH DEPOSITS.	BREATHING ZONE HNU = 3.4 UNITS O_2 = 20.9% LEL = 0%			4	N = 27 REC. = 1.5′
	19	POORLY GRADED SAND (SP): WET, TAN, FINE TO MEDIUM SAND WITH APPROXIMATELY 10% GRAVEL, OUTWASH DEPOSITS.				10	
		WELL GRADED GRAVEL (GW): SAME AS THE INTERVAL FROM 18.5′-18.9′.				17	
	20						
	21						
	22						
	23						
		WELL GRADED GRAVEL (GW): SAME AS THE INTERVAL FROM 18.5′-18.9′ EXCEPT MEDIUM DENSE: GRAVEL UP TO 1½" IN DIAMETER.				6	
	24						

HTW DRILLING LOG

HOLE NO.	SHEET	
WT112B	SHEET 4 OF 7 SHEETS	

PROJECT: HIMCO DUMP SUPERFUND SITE

INSPECTOR: MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
		POORLY GRADED SAND WITH GRAVEL (SP): MEDIUM DENSE, WET, MEDIUM GRAINED SAND, 20%-25% GRAVEL, OUTWASH DEPOSITS.	BREATHING ZONE HNU = 3.2 UNITS O_2 = 20.9% LEL = 0%			9	N = 19 REC. = 0.8′
						10	
	25						
	26						
	27						
	28						
		POORLY GRADED SAND WITH GRAVEL (SP): SAME AS THE INTERVAL FROM 23.9′-25.0′ EXCEPT DENSE, 20% GRAVEL.	BREATHING ZONE HNU = 3.2 UNITS O_2 = 20.9% LEL = 0%			5	N = 36 REC. = 1.5′
	29					12	
						24	
	30						
	31						
	32						
	33						

HTW DRILLING LOG

HOLE NO.	SHEET
WT112B	SHEET 5 OF 7 SHEETS

PROJECT: HIMCO DUMP SUPERFUND SITE

INSPECTOR: MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
		POORLY GRADED SAND WITH GRAVEL (SP): SAME AS THE INTERVAL FROM 23.9'-25.0'.	BREATHING ZONE HNU = 3.0 UNITS O_2 = 20.9% LEL = 0%			6	N = 26 REC. = 1.2'
	34					12	
						14	
	35						
	36						
	37						
	38						
		POORLY GRADED SAND WITH GRAVEL (SP): SAME AS THE INTERVAL FROM 23.9'-25.0' EXCEPT BROWN, 35%-40% GRAVEL UP TO 1½" IN DIAMETER.	BREATHING ZONE HNU = 3.4 UNITS O_2 = 20.9% LEL = 0%			35	N = 29 REC. = 0.4'
	39					16	
						13	
	40						
	41						
	42						
	43						

HTW DRILLING LOG

HOLE NO.	PROJECT	INSPECTOR	SHEET
WT112B	HIMCO DUMP SUPERFUND SITE	MICHELLE BENAK	6 OF 7 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
		POORLY GRADED SAND WITH GRAVEL (SP): SAME AS THE INTERAL FROM 23.9'-25.0' EXCEPT GRAVEL UP TO 1½" IN DIAMETER.	BREATHING ZONE HNU = 3.4 UNITS O_2 = 20.9% LEL = 0%			21	N = 23 REC. = 1.2'
	44					16	
						7	
	45						
	46						
	47						
	48		BREATHING ZONE HNU = 3.0 UNITS O_2 = 20.9% LEL = 0%			15	N = 52 REC. = 1.2'
	49	POORLY GRADED SAND (SP): VERY DENSE, WET, BROWN, FINE SAND, OUTWASH DEPOSITS.				16	
						36	
	50						
	51						
	52						

HTW DRILLING LOG

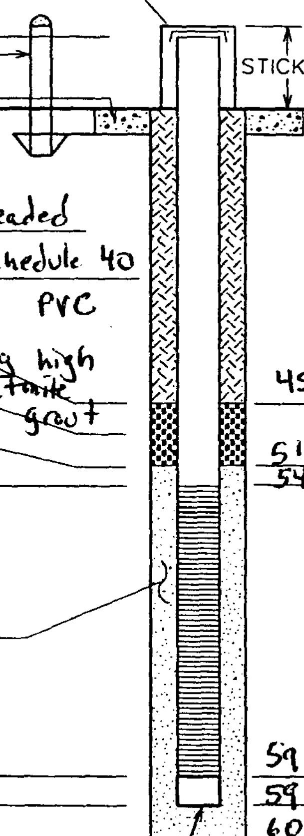
PROJECT	INSPECTOR	HOLE NO. / SHEET
HIMCO DUMP SUPERFUND SITE	MICHELLE BENAK	HOLE NO. WT112B; SHEET 7 OF 7 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	53						
		POORLY GRADED SAND (SP): SAME AS THE INTERVAL FROM 49.2'-50.0'.	BREATHING ZONE HNU = 3.2 UNITS O_2 = 20.9% LEL = 0%			13	N = 62 REC. = 1.5'
	54	POORLY GRADED SAND WITH GRAVEL (SP): VERY DENSE, WET, 25%-30% GRAVEL UP TO 1½" IN DIAMETER, OUTWASH DEPOSITS.				23	
						39	
	55						
	56						
	57						
	58						
		POORLY GRADED SAND (SP): VERY DENSE, WET, OUTWASH DEPOSITS.	BREATHING ZONE HNU = 2.8 UNITS O_2 = 20.9% LEL = 0%	D-1		11	N = 89 (ONE 6" INTERVAL ONLY) REC. = 0.8'
	59					89	
		BOTTOM OF HOLE @ 59.3'					CLEANED HOLE OUT WITH AUGERS TO 60.0', THEN SET MONITORING WELL IN BORING.
	60						

ELEVATION GROUND WATER		PROJECT Himco Dump Superfund Site
DATE INSTALLED	STARTED 8-23-95	COMPLETED 8-24-95
LOCATION (Coordinates or Station) N. 1533653.01 E. 406834.06		
ELEVATION TOP OF HOLE Riser - 766.09 Ground - 763.4		SIGNATURE OF INSPECTOR Michelle Benak
TOTAL DEPTH OF HOLE 60.0 ft.		HOLE NO. WT112B

MONITORING WELL CONSTRUCTION DIAGRAM

(ALL MEASUREMENTS FROM GROUND SURFACE)



PROTECTIVE CASING

TYPE OF PROTECTIVE CASING: 4-inch square steel w/ hinged locking cap

TOP OF WELL

PROTECTIVE POSTS

CONCRETE PAD 4'X4'X4"

STICK-UP 2.7 ft. GROUND SURFACE

CASING DIAMETER: 2 in.

TYPE OF PIPE JOINTS: threaded

LENGTH OF SOLID PIPE 57.1 ft.

TYPE OF BLANK CASING: Schedule 40 PVC

TOP OF SEAL 45.3 ft.

TYPE OF SEAL: Enviroplug high solids bentonite grout

TOP OF FILTERPACK 51.3 ft.

TOP OF SCREEN 54.4 ft.

WELL SCREEN LENGTH 5 ft.

FILTERPACK

BOTTOM OF SCREEN 59.4 ft.

BOTTOM OF WELL 59.6 ft.

BOTTOM OF BORING 60.0 ft.

WELL PLUG

SCREEN INFORMATION

SCREEN DIA.: 2 in.

SLOT WIDTH: 0.020 in.

SCHEDULE: 40

MATERIAL: ☒ PVC ☐ STAINLESS STEEL ☐ OTHER (DESCRIBE)

FILTERPACK MATERIAL

TYPE: 16-30 Colorado Silica

BACKFILL METHOD: Poured down annular space between riser and augers

WATER LEVEL SUMMARY

WATER LEVEL MEASUREMENTS

DATE/TIME/LEVEL 8-24-95 9:58 AM 8.8 ft.

GEOLIB:MISCDIAL.DGN

HTW DRILLING LOG

HOLE NO.	WT113A
1. COMPANY NAME	U.S. ARMY CORPS OF ENGINEERS
2. DRILLING SUBCONTRACTOR	N/A
SHEET 1 OF 1 SHEETS	
3. PROJECT	HIMCO DUMP SUPERFUND SITE
4. LOCATION	ELKHART, IN.
5. NAME OF DRILLER	JOE MORRISSEY
6. MANUFACTURER'S DESIGNATION OF DRILL	GUS PECH 1100C
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	4 1/4" I.D. HSA; 2" O.D. CARBON STEEL SPLIT SPOON SAMPLER DRIVEN BY A 140 POUND HAMMER FOR SPT; HNU P1101 PID; ISTMX 410 CGI.
8. HOLE LOCATION	
9. SURFACE ELEVATION	
10. DATE STARTED	8-10-95
11. DATE COMPLETED	8-10-95
12. OVERBURDEN THICKNESS	UNKNOWN
15. DEPTH GROUNDWATER ENCOUNTERED	16.5'
13. DEPTH DRILLED INTO ROCK	N/A
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	8-11-95 2:30 PM 15.75'
14. TOTAL DEPTH OF HOLE	23.7'
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
						%

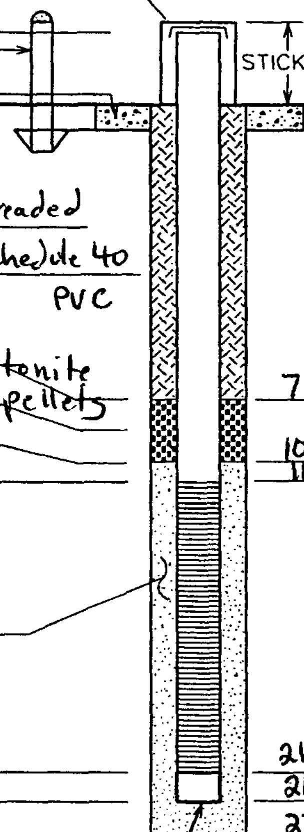
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		2" PVC		MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO. e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	0	SEE LOG OF BORING FOR WT113B FOR A DESCRIPTION OF MATERIALS.	BACKGROUND HNU = 1.0 UNITS O_2 = 20.9% LEL = 0%				AUGERED TO 23.7' AND SET A MONITORING WELL IN THE BORING.
	5		BREATHING ZONE HNU = 0.0 UNITS O_2 = 20.9% LEL = 0%				
	10						
	15						WATER @ 16.5'
			BREATHING ZONE HNU = 2.0 UNITS O_2 = 21.0% LEL = 0%				
	20						
		BOTTOM OF HOLE @ 23.7'					
	25						

ELEVATION GROUND WATER	PROJECT Himco Dump Superfund Site
DATE INSTALLED — STARTED 8-10-95 — COMPLETED 8-11-95	LOCATION (Coordinates or Station) N. 1533608.69 E. 407789.11
ELEVATION TOP OF HOLE Riser - 771.85 Ground - 769.2	SIGNATURE OF INSPECTOR Michelle Benak
TOTAL DEPTH OF HOLE 23.7 ft.	HOLE NO. WT113A

MONITORING WELL CONSTRUCTION DIAGRAM

(ALL MEASUREMENTS FROM GROUND SURFACE)



PROTECTIVE CASING

TYPE OF PROTECTIVE CASING: 4-inch square steel w/ hinged locking cap

TOP OF WELL

PROTECTIVE POSTS

CONCRETE PAD 4'X4'X4"

STICK-UP 2.7 ft. GROUND SURFACE

CASING DIAMETER: 2 in.

TYPE OF PIPE JOINTS: threaded

LENGTH OF SOLID PIPE 14.4 ft.

TYPE OF BLANK CASING: Schedule 40 PVC

TOP OF SEAL 7.1 ft.

TYPE OF SEAL: 3/8" bentonite pellets

TOP OF FILTERPACK 10.6 ft.

TOP OF SCREEN 11.7 ft.

WELL SCREEN LENGTH 10 ft.

FILTERPACK

BOTTOM OF SCREEN 21.7 ft.

BOTTOM OF WELL 21.9 ft.

BOTTOM OF BORING 23.7 ft.

WELL PLUG

SCREEN INFORMATION

SCREEN DIA.: 2 in.

SLOT WIDTH: 0.020 in.

SCHEDULE: 40

MATERIAL: ☒ PVC ☐ STAINLESS STEEL ☐ OTHER (DESCRIBE)

FILTERPACK MATERIAL

TYPE: 16-30 Colorado Silica

BACKFILL METHOD: Poured down annular space between riser and augers.

WATER LEVEL SUMMARY

WATER LEVEL MEASUREMENTS

DATE/TIME/LEVEL 8-10-95 16.5 ft.

8-11-95 2:30 pm 15.75 ft.

HTW DRILLING LOG

HOLE NO.	WT113B
1. COMPANY NAME	U.S. ARMY CORPS OF ENGINEERS
2. DRILLING SUBCONTRACTOR	N/A
SHEET 1 OF 8 SHEETS	
3. PROJECT	HIMCO DUMP SUPERFUND SITE
4. LOCATION	ELKHART, IN.
5. NAME OF DRILLER	JOE MORRISSEY
6. MANUFACTURER'S DESIGNATION OF DRILL	GUS PECH 1100C
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	6 1/4" I.D. HSA; 6" O.D. CME CONTINUOUS SAMPLER TO 23.5', THEN SWITCHED TO 2" O.D. CARBON STEEL SPLIT SPOON SAMPLER DRIVEN BY A 140 POUND HAMMER FOR SPT; HNU P1101 PID; 1STMX 410 CGI.
8. HOLE LOCATION	
9. SURFACE ELEVATION	
10. DATE STARTED	8-9-95
11. DATE COMPLETED	8-10-95
12. OVERBURDEN THICKNESS	UNKNOWN
15. DEPTH GROUNDWATER ENCOUNTERED	16.8'
13. DEPTH DRILLED INTO ROCK	N/A
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	8-10-95 8:03 AM 16.3', 8-11-95 2:15 PM 16.0'
14. TOTAL DEPTH OF HOLE	70.0'
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	1		

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
						%

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		2" PVC		MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO. e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	0	TOPSOIL: BROWN, ROOTS.	BACKGROUND HNU = 0.2 UNITS O_2 = 20.9% LEL = 0%				RUN #1 START 9:44 STOP 9:48 REC. = 5.0'
		POORLY GRADED SAND (SP): MOIST, LIGHT BROWN, FINE TO MEDIUM SAND, OUTWASH DEPOSITS.	BREATHING ZONE HNU = 0.0 UNITS O_2 = 20.9% LEL = 0%				
	1						
	2						
	3						
	4						
	5						

HTW DRILLING LOG

HOLE NO.	SHEET
WT113B	2 OF 8 SHEETS

PROJECT	INSPECTOR
HIMCO DUMP SUPERFUND SITE	MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
		POORLY GRADED SAND (SP): SAME AS THE INTERVAL FROM 0.5'-5.0' EXCEPT FINE TO COARSE SAND AND UP TO 10% GRAVEL.	BREATHING ZONE HNU = 0.2 UNITS O_2 = 21.0% LEL = 0%				RUN #2 START 9:52 STOP 9:56 REC. = 3.7'
	6						
	7						
	8						
	9						
	10		BREATHING ZONE HNU = 0.9 UNITS O_2 = 20.9% LEL = 0%				RUN #3 START 10:01 STOP 10:05
	11						
	12	WELL GRADED GRAVEL WITH SAND (GW): LIGHT BROWN, 65%-70% FINE TO COARSE GRAVEL, 30%-35% FINE TO COARSE SAND, OUTWASH DEPOSITS.					
	13						
	14						MEASURED HOLE @ 14' BELOW GROUND SURFACE AT THE END OF RUN #3.

HTW DRILLING LOG

HOLE NO.	SHEET	PROJECT	INSPECTOR
WT113B	3 OF 8 SHEETS	HIMCO DUMP SUPERFUND SITE	MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	15	WELL GRADED GRAVEL WITH SAND (GW): SAME AS THE INTERVAL FROM 10.0'-15.0'.	BREATHING ZONE HNU = 0.2 UNITS O_2 = 20.9% LEL = 0%				RUN *4 START 10:12 STOP 10:16
	16						
▽							WATER @ 16.8'
	17						
			BREATHING ZONE HNU = 0.7 UNITS O_2 = 21.0% LEL = 0%				MEASURED HOLE @ 17.5' BELOW GROUND SURFACE AT THE END OF RUNWAY.
	18						
	19						
	20						RUN *5
			BREATHING ZONE HNU = 0.4 UNITS O_2 = 20.9% LEL = 0%				
	21						
	22						
	23						
	24	WELL GRADED GRAVEL WITH SAND (GW): SAME AS THE INTERVAL FROM 10.0'-15.0'.				40	

HTW DRILLING LOG

HOLE NO.	SHEET	OF
WT113B	4	8 SHEETS

PROJECT	INSPECTOR
HIMCO DUMP SUPERFUND SITE	MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
						36	N = 139 REC. = 1.5'
						103	AUTOMATIC HAMMER APPARENTLY MELFUNCTIONED, PRODUCING ARTIFICIALLY HIGH BLOW COUNTS.
	25						
	26						
	27						
	28						
		POORLY GRADED SAND WITH GRAVEL (SP): MEDIUM DENSE, WET, BROWN, 15% GRAVEL, OUTWASH DEPOSITS.	BREATHING ZONE HNU = 0.7 UNITS O_2 = 21.0% LEL = 0%			5	N = 18 REC. = 1.3'
	29					7	
						11	
	30						
	31						
	32						
	33						

HTW DRILLING LOG

HOLE NO.	SHEET	OF
WT113B	5	8 SHEETS

PROJECT: HIMCO DUMP SUPERFUND SITE

INSPECTOR: MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	33.5–35.0	POORLY GRADED SAND WITH GRAVEL (SP): SAME AS THE INTERVAL FROM 28.5'-30.0' EXCEPT LOOSE.	BREATHING ZONE HNU = 1.4 UNITS O_2 = 20.9% LEL = 0%			1 / 1 / 3	N = 4 REC. = 0.5'
	37	- - - - - - - - - -					
	38.5–40.0	WELL GRADED SAND (SW): LOOSE, WET, DARK TO LIGHT BROWN, 5% GRAVEL, OUTWASH DEPOSITS.	BREATHING ZONE HNU = 1.4 UNITS O_2 = 20.9% LEL = 0%			1 / 1 / 4	N = 5 REC. = 1.4'
	43						

HTW DRILLING LOG

HOLE NO.	SHEET	PROJECT	INSPECTOR
WT113B	6 OF 8 SHEETS	HIMCO DUMP SUPERFUND SITE	MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	44					9	N = 70 REC. = 1.5'
		WELL GRADED GRAVEL WITH SAND (GW): VERY DENSE, BROWN TO LIGHT BROWN, 80% FINE TO COARSE GRAVEL, 20% FINE TO COARSE SAND, OUTWASH DEPOSITS.	BREATHING ZONE HNU = 1.4 UNITS O_2 = 20.9% LEL = 0%			20	
	45					50	
							MEASURED HOLE @ 45.6' B.O.H.
	46						
	47						
	48						
		WELL GRADED GRAVEL WITH SAND (GW): SAME AS THE INTERVAL FROM 44.2'-45.0' EXCEPT MEDIUM DENSE.	BREATHING ZONE HNU = 1.1 UNITS O_2 = 20.9% LEL = 0%			2	N = 25 REC. = 0.9'
	49					18	
						7	
	50						
	51						
	52						

HTW DRILLING LOG

HOLE NO.	SHEET	OF
WT113B	7	8 SHEETS

PROJECT: HIMCO DUMP SUPERFUND SITE

INSPECTOR: MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	53						
		WELL GRADED SAND (SW): SATURATED, DENSE, OUTWASH DEPOSITS.	BREATHING ZONE HNU = 0.8 UNITS O_2 = 20.9% LEL = 0%			13	N = 49 REC. = 0.8'
	54					28	
						21	
	55						
	56						
	57						
	58						
		POORLY GRADED SAND (SP): MEDIUM DENSE, WET, GREY TO BROWN, 5% GRAVEL, OUTWASH DEPOSITS.	BREATHING ZONE HNU = 0.4 UNITS O_2 = 20.9% LEL = 0%			1	N = 12 REC. = 1.5'
	59					2	
						10	
	60						
	61						
	62						

HTW DRILLING LOG

HOLE NO.	SHEET	
WT113B	SHEET 8	OF 8 SHEETS

PROJECT: HIMCO DUMP SUPERFUND SITE

INSPECTOR: MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	63						
	63.5–65.0	POORLY GRADED SAND (SP): SAME AS THE INTERVAL FROM 58.5'-60.0' EXCEPT LOOSE.	BREATHING ZONE HNU = 0.4 UNITS O_2 = 20.9% LEL = 0%	D-1		2 2 5	N = 7 REC. = 1.5'
	66						
	67						
	68						
	68.5–70.0		BREATHING ZONE HNU = 2.1 UNITS O_2 = 20.9% LEL = 0%			2 3 2	N = 5 REC. = 0
	70	BOTTOM OF HOLE @ 70.0'					BOTTOM OF HOLE MEASURED AT 67.8' BELOW GROUND SURFACE UPON PULLING THE SPLIT SPOON SAMPLER.
	71						

ELEVATION GROUND WATER	PROJECT Himco Dump Superfund Site
DATE INSTALLED — STARTED 8-10-95 — COMPLETED 8-11-95	LOCATION (Coordinates or Station) N. 1533604.43 E. 407779.02
ELEVATION TOP OF HOLE Riser - 772.06 Ground - 769.3	SIGNATURE OF INSPECTOR Michelle Benak
TOTAL DEPTH OF HOLE 67.8 ft.	HOLE NO. WT113B

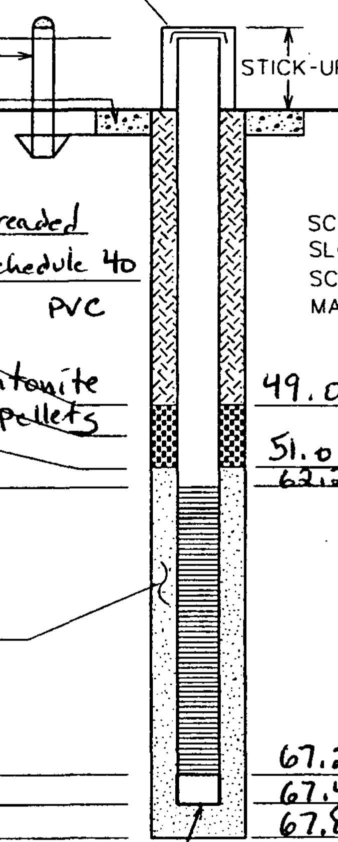
MONITORING WELL CONSTRUCTION DIAGRAM

(ALL MEASUREMENTS FROM GROUND SURFACE)

PROTECTIVE CASING
TYPE OF PROTECTIVE CASING: 4-inch square steel w/ hinged locking cap

TOP OF WELL
PROTECTIVE POSTS
CONCRETE PAD 4'X4'X4"

STICK-UP 2.8 ft. GROUND SURFACE



CASING DIAMETER: 2 in.

TYPE OF PIPE JOINTS: threaded

LENGTH OF SOLID PIPE 65 ft.

TYPE OF BLANK CASING: Schedule 40 PVC

TOP OF SEAL 49.0 ft.

TYPE OF SEAL: 3/8" bentonite pellets

TOP OF FILTERPACK 51.0 ft.

TOP OF SCREEN 62.2 ft.

SCREEN INFORMATION

SCREEN DIA.: 2 in.
SLOT WIDTH: 0.020 in.
SCHEDULE: 40
MATERIAL: ☒ PVC ☐ STAINLESS STEEL ☐ OTHER (DESCRIBE)

WELL SCREEN LENGTH 5 ft.

FILTERPACK

FILTERPACK MATERIAL
TYPE: 16-30 Colorado Silica
BACKFILL METHOD: Poured down annular space between riser and augers.

BOTTOM OF SCREEN 67.2 ft.
BOTTOM OF WELL 67.4 ft.
BOTTOM OF BORING 67.8 ft.

WELL PLUG

WATER LEVEL SUMMARY

WATER LEVEL MEASUREMENTS
DATE/TIME/LEVEL
8-9-95 10:15 AM 16.8 ft.
8-10-95 8:03 AM 16.3 ft.
8-11-95 2:15 PM 16.0 ft.

HTW DRILLING LOG

HOLE NO.	WT114A
1. COMPANY NAME	U.S. ARMY CORPS OF ENGINEERS
2. DRILLING SUBCONTRACTOR	N/A
SHEET 1 OF 3 SHEETS	
3. PROJECT	HIMCO DUMP SUPERFUND SITE
4. LOCATION	ELKHART, IN.
5. NAME OF DRILLER	JOE MORRISSEY
6. MANUFACTURER'S DESIGNATION OF DRILL	GUS PECH 1100C
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	4¼" I.D. HSA; 2" O.D. CARBON STEEL SPLIT SPOON SAMPLER DRIVEN BY A 140 POUND HAMMER FOR SPT; HNU P1101PID; ISTMX 410 CGI.
8. HOLE LOCATION	
9. SURFACE ELEVATION	
10. DATE STARTED	8-21-95
11. DATE COMPLETED	8-21-95
12. OVERBURDEN THICKNESS	UNKNOWN
15. DEPTH GROUNDWATER ENCOUNTERED	16.0'
13. DEPTH DRILLED INTO ROCK	N/A
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	8-22-95 7:47 AM 15.1'
14. TOTAL DEPTH OF HOLE	23.0'
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	1		

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
						%

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		2" PVC		MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO. e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	0		BACKGROUND HNU = 0.6 UNITS O_2 = 20.9% LEL = 0%				
	1						
	2						
	3						
		POORLY GRADED SAND (SP): LOOSE MOIST, TAN, MEDIUM TO COARSE SAND, OUTWASH DEPOSITS.	BREATHING ZONE HNU = 0.2 UNITS O_2 = 20.9% LEL = 0%			3	N = 6 REC. = 1.3'
	4					3	
	5					3	

HTW DRILLING LOG

HOLE NO.	SHEET	PROJECT	INSPECTOR
WT114A	2 OF 3 SHEETS	HIMCO DUMP SUPERFUND SITE	MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	6						
	7						
	8						
	8.5–10	POORLY GRADED SAND (SP): SAME AS THE INTERVAL FROM 3.5′-5.0′ EXCEPT RUST COLOR, COARSER SAND.	BREATHING ZONE HNU = 0.2 UNITS O_2 = 20.9% LEL = 0%			3 4 5	N = 9 REC. = 1.4′
	10						
	11						
	12						
	13						
	13.5–14.5	POORLY GRADED SAND (SP): SAME AS THE INTERVAL FROM 3.5′-5.0′ EXCEPT LIGHT BROWN, COARSER SAND.	BREATHING ZONE HNU = 0.1 UNITS O_2 = 21.0% LEL = 0%			3 3	N = 7 REC. = 1.5′

HTW DRILLING LOG

HOLE NO. WT114A

PROJECT: HIMCO DUMP SUPERFUND SITE

INSPECTOR: MICHELLE BENAK

SHEET 3 OF 3 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
						4	
	15						
▽	16						WATER @ 16.0′
	17						
	18						
		POORLY GRADED SAND (SP): SAME AS THE INTERVAL FROM 3.5′-5.0′ EXCEPT MEDIUM DENSE, WET, BROWN. 10% GRAVEL.		D-1		4	N = 25 REC. = 1.5′
	19					8	
						17	
	20						
	21						
	22						
	23	BOTTOM OF HOLE @ 23.0′					
	24						

ELEVATION GROUND WATER	PROJECT Himco Dump Superfund Site
DATE INSTALLED — STARTED 8-21-95 — COMPLETED 8-22-95	LOCATION (Coordinates or Station) N. 1531843.97 E. 407997.29
ELEVATION TOP OF HOLE Riser - 769.19 Ground - 766.7	SIGNATURE OF INSPECTOR Michelle Benak
TOTAL DEPTH OF HOLE 23.0 ft.	HOLE NO. WT114A

MONITORING WELL CONSTRUCTION DIAGRAM

(ALL MEASUREMENTS FROM GROUND SURFACE)

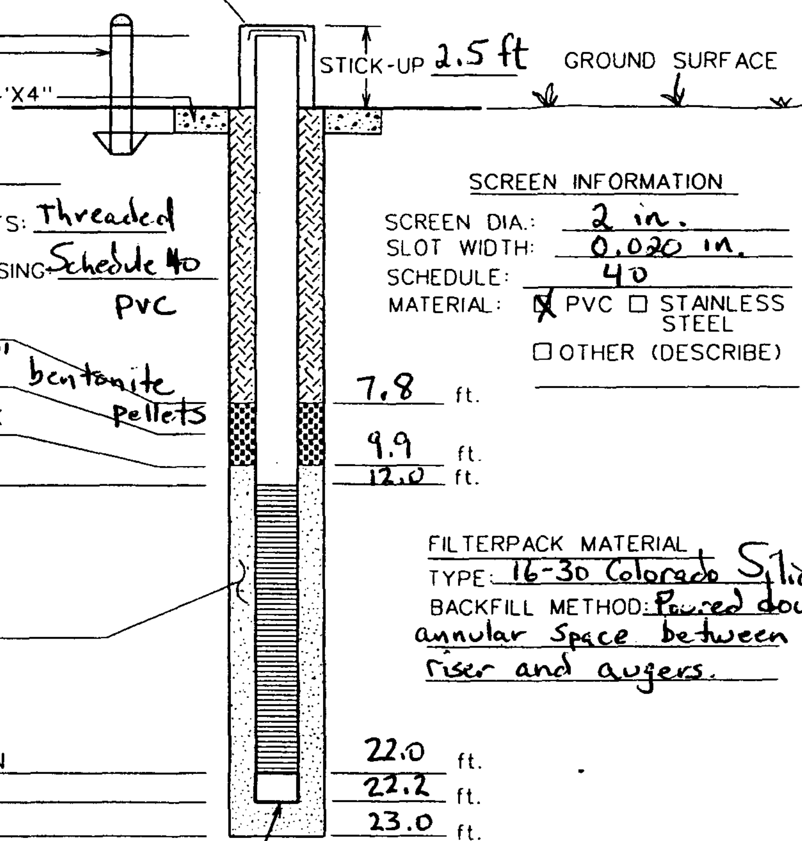
PROTECTIVE CASING

TYPE OF PROTECTIVE CASING: 4-inch square steel w/ hinged locking cap

TOP OF WELL

PROTECTIVE POSTS

CONCRETE PAD 4'X4'X4"



STICK-UP 2.5 ft GROUND SURFACE

CASING DIAMETER: 2 in.

TYPE OF PIPE JOINTS: Threaded

14.5 ft. LENGTH OF SOLID PIPE

TYPE OF BLANK CASING: Schedule 40 PVC

TOP OF SEAL 7.8 ft.

TYPE OF SEAL: 3/8" bentonite pellets

TOP OF FILTERPACK 9.9 ft.

TOP OF SCREEN 12.0 ft.

SCREEN INFORMATION

SCREEN DIA.: 2 in.

SLOT WIDTH: 0.020 in.

SCHEDULE: 40

MATERIAL: ☒ PVC ☐ STAINLESS STEEL ☐ OTHER (DESCRIBE)

FILTERPACK MATERIAL

TYPE: 16-30 Colorado Silica

BACKFILL METHOD: Poured down annular space between riser and augers.

10 ft. WELL SCREEN LENGTH

FILTERPACK

BOTTOM OF SCREEN 22.0 ft.

BOTTOM OF WELL 22.2 ft.

BOTTOM OF BORING 23.0 ft.

WELL PLUG

WATER LEVEL SUMMARY

WATER LEVEL MEASUREMENTS

DATE/TIME/LEVEL

8-21-95 1:39 PM 16.0 ft.

8-22-95 7:47 AM 15.1 ft.

GEOLIB:MISCDIAL.DGN

HTW DRILLING LOG

HOLE NO.	SHEET
WT114B	6 OF 8 SHEETS

PROJECT	INSPECTOR
HIMCO DUMP SUPERFUND SITE	MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	44	POORLY GRADED SAND WITH GRAVEL (SP): SAME AS THE INTERVAL FROM 33.5'-35.0' EXCEPT MEDIUM DENSE. 35% GRAVEL.	BREATHING ZONE HNU = 4.8 UNITS O_2 = 20.7% LEL = 0%			13 14 13	N = 27 REC. = 0.2'
	45						
	46						
	47						
	48						
	49	POORLY GRADED SAND (SP): MEDIUM DENSE, WET, BROWN, MEDIUM TO COARSE SAND, TRACE OF GRAVEL, OUTWASH DEPOSITS.	BREATHING ZONE HNU = 5.0 UNITS O_2 = 20.7% LEL = 0%			23 20 6	N = 26 REC. = 0.7'
	50						
	51						
	52						

HTW DRILLING LOG

HOLE NO.	SHEET	PROJECT	INSPECTOR
WT114B	7 OF 8 SHEETS	HIMCO DUMP SUPERFUND SITE	MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	53						
		WELL GRADED SAND WITH GRAVEL (SW): MEDIUM DENSE, WET, BROWN, GRAVEL UP TO 3/4" IN DIAMETER.	BREATHING ZONE HNU = 3.8 UNITS O_2 = 20.8% LEL = 0%			10	N = 21 REC. = 0.1'
	54					12	
						9	
	55						
	56						
	57						
	58						
		WELL GRADED SAND WITH GRAVEL (SW): SAME AS THE INTERVAL FROM 53.5'-55.0'.	BREATHING ZONE HNU = 3.8 UNITS O_2 = 20.8% LEL = 0%			15	N = 18 REC. = 0.5'
	59					9	
						9	
	60						
	61						
	62						

HTW DRILLING LOG

HOLE NO. WT114B

PROJECT: HIMCO DUMP SUPERFUND SITE

INSPECTOR: MICHELLE BENAK

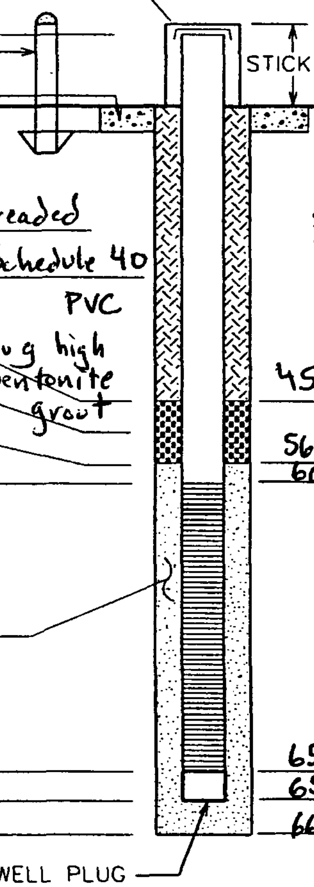
SHEET 8 OF 8 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	63						
	64	WELL GRADED GRAVEL WITH SAND (GW): MEDIUM DENSE, WET, BROWN TO GREY, 15%-20% MEDIUM TO COARSE SAND, OUTWASH DEPOSITS.	BREATHING ZONE HNU = 4.8 UNITS O_2 = 20.8% LEL = 0%	D-1		5 7 12	N = 19 REC. = 1.5'
	65						
	66	BOTTOM OF HOLE @ 66.0'					
	67						

ELEVATION GROUND WATER			PROJECT Himco Dump Superfund Site
DATE INSTALLED	STARTED 8-22-95	COMPLETED 8-23-95	LOCATION (Coordinates or Station) N. 1531834.38 E. 407995.71
ELEVATION TOP OF HOLE Riser - 769.37 Ground - 766.9			SIGNATURE OF INSPECTOR Michelle Benak
TOTAL DEPTH OF HOLE 66.0 ft.			HOLE NO. WT114B

MONITORING WELL CONSTRUCTION DIAGRAM

(ALL MEASUREMENTS FROM GROUND SURFACE)



PROTECTIVE CASING

TYPE OF PROTECTIVE CASING: 4-inch square steel w/ hinged locking cap

TOP OF WELL

PROTECTIVE POSTS

CONCRETE PAD 4'X4'X4"

STICK-UP 2.5 ft.

GROUND SURFACE

CASING DIAMETER: 2 in.

TYPE OF PIPE JOINTS: threaded

LENGTH OF SOLID PIPE: 62.8 ft.

TYPE OF BLANK CASING: Schedule 40 PVC

TOP OF SEAL: 45.7 ft.

TYPE OF SEAL: Enviroplug high solids bentonite grout

TOP OF FILTERPACK: 56.2 ft.

TOP OF SCREEN: 60.3 ft.

SCREEN INFORMATION

SCREEN DIA.: 2 in.

SLOT WIDTH: 0.020 in.

SCHEDULE: 40

MATERIAL: ☒ PVC ☐ STAINLESS STEEL ☐ OTHER (DESCRIBE)

WELL SCREEN LENGTH: 5 ft.

FILTERPACK

FILTERPACK MATERIAL

TYPE: 16-30 Colorado Silica

BACKFILL METHOD: Poured down annular space between riser and augers.

BOTTOM OF SCREEN: 65.3 ft.

BOTTOM OF WELL: 65.5 ft.

BOTTOM OF BORING: 66.0 ft.

WELL PLUG

WATER LEVEL SUMMARY

WATER LEVEL MEASUREMENTS

DATE/TIME/LEVEL 8-23-95 9:00 Am 15.2 ft.

GEOLIB:MISCDIA1.DGN

HTW DRILLING LOG

HOLE NO.	WT115A
1. COMPANY NAME	U.S. ARMY CORPS OF ENGINEERS
2. DRILLING SUBCONTRACTOR	N/A
SHEET 1 OF 3 SHEETS	
3. PROJECT	HIMCO DUMP SUPERFUND SITE
4. LOCATION	ELKHART, IN.
5. NAME OF DRILLER	JOE MORRISSEY
6. MANUFACTURER'S DESIGNATION OF DRILL	GUS PECH 1100C
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	4 1/4" I.D. HSA; 2" O.D. CARBON STEEL SPLIT SPOON SAMPLER DRIVEN BY A 140 POUND HAMMER FOR SPT; HNU P1101PID; ISTMX 410 CGI.
8. HOLE LOCATION	
9. SURFACE ELEVATION	
10. DATE STARTED	8-22-95
11. DATE COMPLETED	8-22-95
12. OVERBURDEN THICKNESS	UNKNOWN
15. DEPTH GROUNDWATER ENCOUNTERED	12.2'
13. DEPTH DRILLED INTO ROCK	N/A
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE	18.0'
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	1		

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
						%

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		2" PVC		MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO. e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	0		BACKGROUND HNU = 1.0 UNITS O_2 = 20.9% LEL = 0%				
	1						
	2						
	3						
		POORLY GRADED SAND (SP): LOOSE, MOIST, TAN, MEDIUM TO COARSE SAND, OUTWASH DEPOSITS.	BREATHING ZONE HNU = 1.5 UNITS O_2 = 20.9% LEL = 0%			2	N = 9 REC. = 1.5'
	4					4	
	5					5	

HTW DRILLING LOG

HOLE NO.	SHEET
WT115A	2 OF 3 SHEETS

PROJECT	INSPECTOR
HIMCO DUMP SUPERFUND SITE	MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	6						
	7						
	8						
		POORLY GRADED SAND (SP): SAME AS THE INTERVAL FROM 3.5'-5.0' EXCEPT A LITTLE FINER GRAINED.	BREATHING ZONE HNU = 0.8 UNITS O_2 = 20.9% LEL = 0%			1	N = 3 REC. = 0.4'
	9					1	
						2	
	10						
	11						
▽	12						WATER @ 12.2'
	13						
		POORLY GRADED SAND (SP): SAME AS THE INTERVAL FROM 3.5'-5.0' EXCEPT MEDIUM DENSE.	BREATHING ZONE HNU = 0.6 UNITS O_2 = 21.0% LEL = 0%	D-1		3	N = 10 REC. = 1.5'
	14					5	

HTW DRILLING LOG

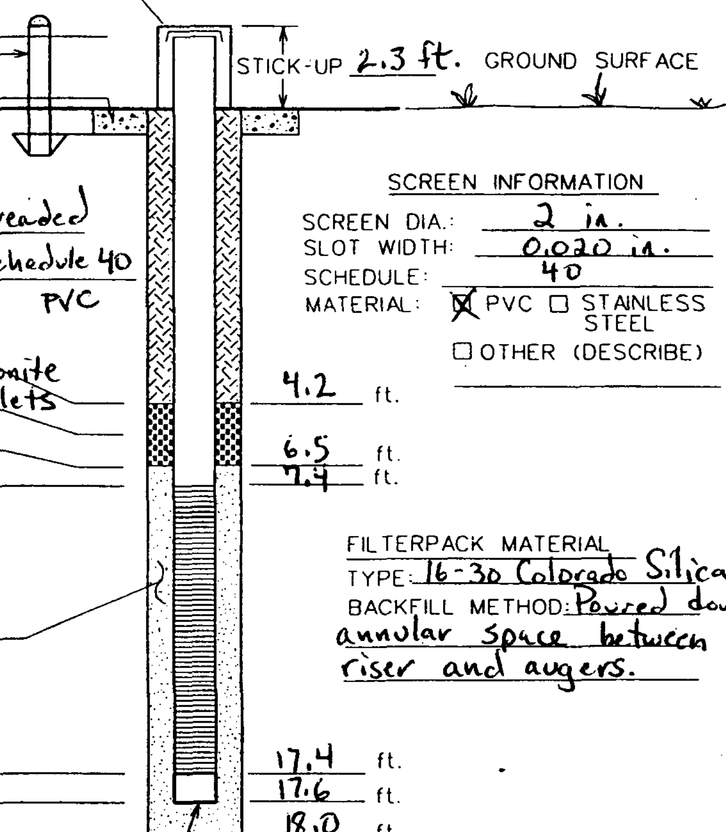
PROJECT	INSPECTOR	HOLE NO.
HIMCO DUMP SUPERFUND SITE	MICHELLE BENAK	WT115A
		SHEET 3 OF 3 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
				D-1		5	
	15						
	16						
	17						
	18	BOTTOM OF HOLE @ 18.0'					
	19						

ELEVATION GROUND WATER			PROJECT Himco Dump Superfund Site
DATE INSTALLED	STARTED 8-22-95	COMPLETED 8-23-95	LOCATION (Coordinates or Station) N. 1531675.84 E. 407261.44
ELEVATION TOP OF HOLE Riser- 765.87 Ground- 763.6			SIGNATURE OF INSPECTOR Michelle Benak
TOTAL DEPTH OF HOLE 18.0 ft.			HOLE NO. WT115A

MONITORING WELL CONSTRUCTION DIAGRAM

(ALL MEASUREMENTS FROM GROUND SURFACE)



PROTECTIVE CASING

TYPE OF PROTECTIVE CASING: 4-inch square steel w/ hinged locking cap

TOP OF WELL

PROTECTIVE POSTS

CONCRETE PAD 4'X4'X4"

STICK-UP 2.3 ft. GROUND SURFACE

CASING DIAMETER: 2 in.

TYPE OF PIPE JOINTS: threaded

LENGTH OF SOLID PIPE 9.7 ft.

TYPE OF BLANK CASING: Schedule 40 PVC

TOP OF SEAL 4.2 ft.

TYPE OF SEAL: 3/8" bentonite pellets

TOP OF FILTERPACK 6.5 ft.

TOP OF SCREEN 7.4 ft.

SCREEN INFORMATION

SCREEN DIA.: 2 in.

SLOT WIDTH: 0.020 in.

SCHEDULE: 40

MATERIAL: ☒ PVC ☐ STAINLESS STEEL ☐ OTHER (DESCRIBE)

WELL SCREEN LENGTH 10 ft.

FILTERPACK

FILTERPACK MATERIAL

TYPE: 16-30 Colorado Silica

BACKFILL METHOD: Poured down annular space between riser and augers.

BOTTOM OF SCREEN 17.4 ft.

BOTTOM OF WELL 17.6 ft.

BOTTOM OF BORING 18.0 ft.

WELL PLUG

WATER LEVEL SUMMARY

WATER LEVEL MEASUREMENTS

DATE/TIME/LEVEL 8-22-95 1:00 PM 12.2 ft.

HTW DRILLING LOG

HOLE NO. WT116A

SHEET 1 OF 3 SHEETS

1. COMPANY NAME: U.S. ARMY CORPS OF ENGINEERS
2. DRILLING SUBCONTRACTOR: N/A
3. PROJECT: HIMCO DUMP SUPERFUND SITE
4. LOCATION: ELKHART, IN.
5. NAME OF DRILLER: JOE MORRISSEY
6. MANUFACTURER'S DESIGNATION OF DRILL: GUS PECH 1100C
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4 1/4" I.D. HSA; 2" O.D. CARBON STEEL SPLIT SPOON SAMPLER DRIVEN BY A 140 POUND HAMMER FOR SPT; HNU PI101PID; ISTMX 410 CGI.
8. HOLE LOCATION:
9. SURFACE ELEVATION:
10. DATE STARTED: 8-17-95
11. DATE COMPLETED: 8-17-95
12. OVERBURDEN THICKNESS: UNKNOWN
13. DEPTH DRILLED INTO ROCK: N/A
14. TOTAL DEPTH OF HOLE: 15.0'
15. DEPTH GROUNDWATER ENCOUNTERED: 10.6'
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 8-18-95 7:40 AM 7.9'
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	1		

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
						%

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		2" PVC		MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO. e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	0	SEE LOG OF BORING FOR WT116B FOR A DESCRIPTION OF MATERIALS DOWN TO 10' BELOW GROUND SURFACE.	BACKGROUND HNU = 0.2 UNITS O_2 = 20.9% LEL = 0%				AUGERED TO 13.5' AND OBTAINED A SAMPLE FROM 13.5'- 15.0'.
	1						
	2						
	3						
	4						
	5						

PROJECT: HIMCO DUMP SUPERFUND SITE

HOLE NO. WT116A

HTW DRILLING LOG

HOLE NO.	
WT116A	

PROJECT	INSPECTOR	SHEET 2
HIMCO DUMP SUPERFUND SITE	MICHELLE BENAK	OF 3 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	6						
	7						
	8						
	9						
	10						
▽							WATER @ 10.6′
	11						
	12						
	13						
		POORLY GRADED SAND (SP): LOOSE, WET, GREY, 5% GRAVEL, OUTWASH DEPOSITS.				1	N = 4 REC. = 1.5′
	14		BREATHING ZONE O_2 = 20.9% LEL = 0%			1	

HTW DRILLING LOG

HOLE NO.	SHEET	OF SHEETS
WT116A	3	3

PROJECT	INSPECTOR
HIMCO DUMP SUPERFUND SITE	MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
						3	
	15	BOTTOM OF HOLE @ 15.0'					
	16						

ELEVATION GROUND WATER	PROJECT Himco Dump Superfund Site
DATE INSTALLED — STARTED 8-17-95 — COMPLETED 8-18-95	LOCATION (Coordinates or Station) N. 1531925.50 E. 406784.96
ELEVATION TOP OF HOLE Riser - 763.86 Ground - 761.7	SIGNATURE OF INSPECTOR Michelle Renak
TOTAL DEPTH OF HOLE 15.0 ft.	HOLE NO. WT116A

MONITORING WELL CONSTRUCTION DIAGRAM

(ALL MEASUREMENTS FROM GROUND SURFACE)

PROTECTIVE CASING

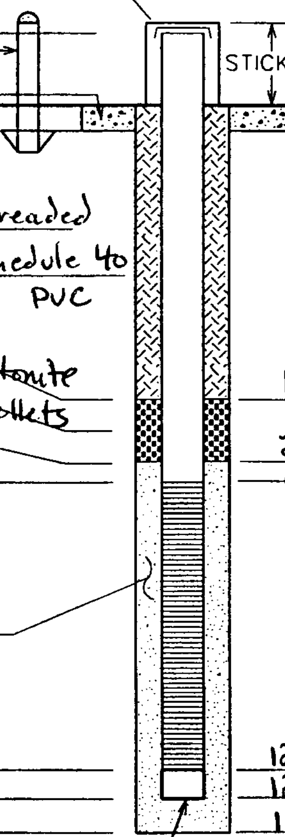
TYPE OF PROTECTIVE CASING: 4-inch square steel w/ hinged locking cap

TOP OF WELL

PROTECTIVE POSTS

CONCRETE PAD 4'X4'X4"

STICK-UP 2.2 ft. GROUND SURFACE



CASING DIAMETER: 2 in.

TYPE OF PIPE JOINTS: threaded

LENGTH OF SOLID PIPE 4.8 ft.

TYPE OF BLANK CASING Schedule 40 PVC

TOP OF SEAL 1.0 ft.

TYPE OF SEAL: 3/8" bentonite pellets

TOP OF FILTERPACK 2.0 ft.

TOP OF SCREEN 2.6 ft.

WELL SCREEN LENGTH 10 ft.

FILTERPACK

BOTTOM OF SCREEN 12.6 ft.

BOTTOM OF WELL 12.8 ft.

BOTTOM OF BORING 15.0 ft.

WELL PLUG

SCREEN INFORMATION

SCREEN DIA.: 2 in.

SLOT WIDTH: 0.020 in.

SCHEDULE: 40

MATERIAL: ☒ PVC ☐ STAINLESS STEEL ☐ OTHER (DESCRIBE)

FILTERPACK MATERIAL

TYPE: 16-30 Colorado Silica

BACKFILL METHOD: Poured down annular space between riser and augers.

WATER LEVEL SUMMARY

WATER LEVEL MEASUREMENTS

DATE/TIME/LEVEL 8-17-95 1:45 PM 10.6 ft.
8-18-95 7:40 AM 7.9 ft.

GEOLIB:MISCDIA1.DGN

HTW DRILLING LOG

HOLE NO.	WT116B
1. COMPANY NAME	U.S. ARMY CORPS OF ENGINEERS
2. DRILLING SUBCONTRACTOR	N/A
SHEET 1 OF 7 SHEETS	
3. PROJECT	HIMCO DUMP SUPERFUND SITE
4. LOCATION	ELKHART, IN.
5. NAME OF DRILLER	JOE MORRISSEY
6. MANUFACTURER'S DESIGNATION OF DRILL	GUS PECH 1100C
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	6 1/4" I.D. HSA; 2" O.D. CARBON STEEL SPLIT SPOON SAMPLER DRIVEN BY A 140 POUND HAMMER FOR SPT; HNU P1101 PID; ISTMX 410 CGI.
8. HOLE LOCATION	
9. SURFACE ELEVATION	
10. DATE STARTED	8-16-95
11. DATE COMPLETED	8-17-95
12. OVERBURDEN THICKNESS	UNKNOWN
15. DEPTH GROUNDWATER ENCOUNTERED	2.4' (CEMENT MAY HAVE TRAPPED WATER)
13. DEPTH DRILLED INTO ROCK	N/A
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	8-16-95 12:40 PM 9.5' 8-17-95 7:35 AM 7.6'
14. TOTAL DEPTH OF HOLE	60.0'
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	8-18-95 9:00 AM 10.9'

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	1		

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
						%

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		2" PVC		MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO. e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	0	TOPSOIL - VEGETATED, WEEDS.	BACKGROUND HNU = 2.6 UNITS O_2 = 20.8% LEL = 0%				
	1						
	2						
▽							WATER @ 2.4'
	3						
						65	N = 73 REC. = 1.4'
	4	CONSTRUCTION RUBBLE: RECOVERED PIECES OF CONCRETE, COVERED BY BLACK SUBSTANCE.	BREATHING ZONE HNU = 3.2 UNITS O_2 = 20.8% LEL = 0%			8	
	5					65	

HTW DRILLING LOG

HOLE NO.	SHEET
WT116B	SHEET 2 OF 7 SHEETS

PROJECT	INSPECTOR
HIMCO DUMP SUPERFUND SITE	MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	6						
	7						
	8						
		POORLY GRADED SAND (SP): LOOSE, MOIST, GREY, FINE TO MEDIUM SAND, OUTWASH DEPOSITS.	BREATHING ZONE HNU = 0.4 UNITS			1	N = 6 REC. = 1.4'
	9	ORGANIC SOIL (OL/OH): MEDIUM STIFF, MOIST, BLACK, SOME ROOTS.	O_2 = 20.8% LEL = 0%			3	
						3	
	10						
	11						
	12						
	13						
		POORLY GRADED SAND (SP): LOOSE, WET, GREY, MEDIUM SAND, 5% GRAVEL, OUTWASH DEPOSITS.	BREATHING ZONE HNU = 1.0 UNITS			1	N = 3 REC. = 1.5'
	14		O_2 = 20.9% LEL = 0%			2	

HTW DRILLING LOG

HOLE NO.	SHEET	PROJECT	INSPECTOR
WT116B	3 OF 7 SHEETS	HIMCO DUMP SUPERFUND SITE	MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
						1	
	15						
	16						
	17						
	18						
		NO RECOVERY	BREATHING ZONE HNU = 1.2 UNITS O_2 = 20.9% LEL = 0%			1	N = 2 REC. = 0.0′
	19					1	
						1	
	20						
	21						
	22						
	23						
		POORLY GRADED SAND (SP): SAME AS THE INTERVAL FROM 13.5′-15.0′ EXCEPT MEDIUM DENSE, MEDIUM TO COARSE SAND, 10% GRAVEL.	BREATHING ZONE HNU = 1.2 UNITS O_2 = 20.9% LEL = 0%			4	
	24						

HTW DRILLING LOG

HOLE NO.
WT116B

PROJECT	INSPECTOR	SHEET
HIMCO DUMP SUPERFUND SITE	MICHELLE BENAK	SHEET 4 OF 7 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
						8	N = 20 REC. = 1.5'
						12	
	25						
	26						
	27						
	28						
		POORLY GRADED SAND (SP): SAME AS THE INTERVAL FROM 13.5'-15.0' EXCEPT MEDIUM DENSE, MEDIUM TO COARSE SAND.	BREATHING ZONE HNU = 1.4 UNITS O_2 = 20.9% LEL = 0%			9	N = 10 REC. = 1.4'
	29					7	
						3	
	30						
	31						
	32						
	33						END OF DRILLING 8-16-95

HTW DRILLING LOG

HOLE NO.	SHEET	PROJECT	INSPECTOR
WT116B	SHEET 5 OF 7 SHEETS	HIMCO DUMP SUPERFUND SITE	MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
		POORLY GRADED SAND (SP): SAME AS THE INTERVAL FROM 13.5'-15.0'.	BREATHING ZONE HNU = 1.6 UNITS O_2 = 20.8% LEL = 0%			1	BEGIN DRILLING ON 8-17-95
	34					2	N = 5 REC. = 1.5'
						3	
	35						
	36						
	37						
	38						
		POORLY GRADED SAND (SP): SAME AS THE INTERVAL FROM 13.5'-15.0'.	BREATHING ZONE HNU = 0.8 UNITS O_2 = 20.8% LEL = 0%			1	N = 6 REC. = 1.5'
	39					3	
						3	
	40						
	41						
	42						
	43						

HTW DRILLING LOG

HOLE NO.	SHEET	OF
WT116B	6	7 SHEETS

PROJECT: HIMCO DUMP SUPERFUND SITE

INSPECTOR: MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	43.5	POORLY GRADED SAND (SP): SAME AS THE INTERVAL FROM 13.5'-15.0' EXCEPT MEDIUM DENSE.	BREATHING ZONE HNU = 2.2 UNITS O_2 = 20.8% LEL = 0%			8	N = 15 REC. = 1.5'
	44					10	
	44.5					5	
	45						
	46						
	47						
	48						
	48.5	POORLY GRADED SAND (SP): SAME AS THE INTERVAL FROM 13.5'-15.0'.	BREATHING ZONE HNU = 0.8 UNITS O_2 = 20.8% LEL = 0%			5	N = 9 REC. = 1.5'
	49					5	
	49.5					4	
	50						
	51						
	52						

HTW DRILLING LOG

HOLE NO. WT116B

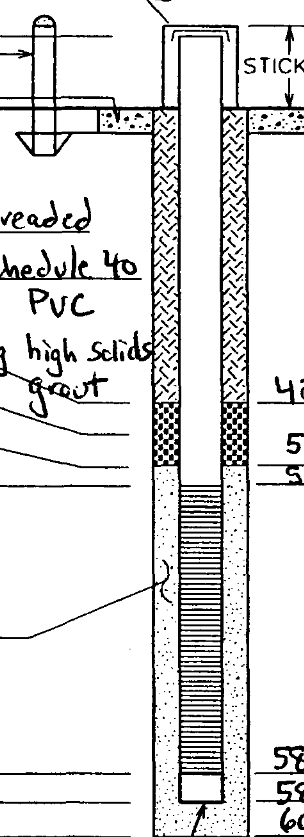
PROJECT: HIMCO DUMP SUPERFUND SITE | INSPECTOR: MICHELLE BENAK | SHEET 7 OF 7 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	53						
	54	POORLY GRADED SAND (SP): SAME AS THE INTERVAL FROM 13.5'-15.0' EXCEPT MEDIUM TO COARSE SAND.	BREATHING ZONE HNU = 2.0 UNITS O_2 = 20.8% LEL = 0%			2	N = 7 REC. = 1.5'
		POORLY GRADED SAND (SP): LOOSE, WET, BROWN, FINE SAND, OUTWASH DEPOSITS.				2	
						5	
	55						
	56						
	57						
	58						
	59	POORLY GRADED SAND (SP): LOOSE, WET, GREY, 10% GRAVEL, OUTWASH DEPOSITS.	BREATHING ZONE HNU = 1.0 UNITS O_2 = 20.9% LEL = 0%	D-1		3	N = 6 REC. = 1.5'
						3	
						3	
	60	BOTTOM OF HOLE @ 60.0'					
	61						
	62						

ELEVATION GROUND WATER			PROJECT Himco Dump Superfund Site
DATE INSTALLED	STARTED 8-17-95	COMPLETED 8-18-95	LOCATION (Coordinates or Station) N. 1531931.04 E. 406775.79
ELEVATION TOP OF HOLE Riser - 763.89 Ground - 761.9			SIGNATURE OF INSPECTOR Michelle Bernat
TOTAL DEPTH OF HOLE 60.0 ft.			HOLE NO. WT116B

MONITORING WELL CONSTRUCTION DIAGRAM

(ALL MEASUREMENTS FROM GROUND SURFACE)



PROTECTIVE CASING

TYPE OF PROTECTIVE CASING: 4-inch square steel w/ hinged locking cap

TOP OF WELL

PROTECTIVE POSTS

CONCRETE PAD 4'X4'X4"

STICK-UP 2.0 ft.

GROUND SURFACE

CASING DIAMETER: 2 in.

TYPE OF PIPE JOINTS: threaded

LENGTH OF SOLID PIPE 55.4 ft.

TYPE OF BLANK CASING: Schedule 40 PVC

TOP OF SEAL 42.0 ft.

TYPE OF SEAL: Enviroplug high solids bentonite grout

TOP OF FILTERPACK 50.2 ft.

TOP OF SCREEN 53.4 ft.

SCREEN INFORMATION

SCREEN DIA.: 2 in.

SLOT WIDTH: 0.020 in.

SCHEDULE: 40

MATERIAL: ☒ PVC ☐ STAINLESS STEEL ☐ OTHER (DESCRIBE)

WELL SCREEN LENGTH 5 ft.

FILTERPACK

FILTERPACK MATERIAL

TYPE: 16-30 Colorado Silica

BACKFILL METHOD: Poured down annular space between riser and augers.

BOTTOM OF SCREEN 58.4 ft.

BOTTOM OF WELL 58.6 ft.

BOTTOM OF BORING 60.0 ft.

WELL PLUG

WATER LEVEL SUMMARY

WATER LEVEL MEASUREMENTS

DATE/TIME/LEVEL
8-16-95 10:05 Am 2.4 ft.
8-16-95 12:40 Pm 9.5 ft.
8-17-95 7:35 Am 7.6 ft.
8-18-95 9:00 Am 10.9 ft.

HTW DRILLING LOG

HOLE NO.	WT117A
1. COMPANY NAME	U.S. ARMY CORPS OF ENGINEERS
2. DRILLING SUBCONTRACTOR	N/A
SHEET 1 OF 3 SHEETS	
3. PROJECT	HIMCO DUMP SUPERFUND SITE
4. LOCATION	ELKHART, IN.
5. NAME OF DRILLER	JOE MORRISSEY
6. MANUFACTURER'S DESIGNATION OF DRILL	GUS PECH 1100C
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	4 1/4" I.D. HSA; 2" O.D. CARBON STEEL SPLIT SPOON SAMPLER DRIVEN BY A 140 POUND HAMMER FOR SPT; HNU P1101PID; ISTMX 410 CGI.
8. HOLE LOCATION	
9. SURFACE ELEVATION	
10. DATE STARTED	8-15-95
11. DATE COMPLETED	8-15-95
12. OVERBURDEN THICKNESS	UNKNOWN
15. DEPTH GROUNDWATER ENCOUNTERED	SEE LOG OF WT117B
13. DEPTH DRILLED INTO ROCK	N/A
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	8-18-95 11:00AM 11.3′
14. TOTAL DEPTH OF HOLE	17.5′
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	1		

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		2" PVC		MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO. e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	0	SEE LOG OF BORING FOR WT117B FOR A DESCRIPTION OF MATERIALS DOWN TO 10′ BELOW GROUND SURFACE.	BACKGROUND HNU = 1.2 UNITS O_2 = 20.9% LEL = 0%				AUGERED TO 13.5′ AND OBTAINED A SAMPLE FROM 13.5′- 15.0′.
	1		BREATHING ZONE HNU = 1.2 UNITS O_2 = 20.8% LEL = 0%				
	2						
	3						
	4						
	5						

HTW DRILLING LOG

HOLE NO.
WT117A

PROJECT	INSPECTOR	SHEET 2 OF 3 SHEETS
HIMCO DUMP SUPERFUND SITE	MICHELLE BENAK	

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	6						
	7						
	8						
	9						
	10						
	11						
	12						
	13						
		WELL GRADED SAND (SW): MEDIUM DENSE, WET, BROWN, FINE TO MEDIUM SAND, OUTWASH DEPOSITS.				4	N = 10 REC. = 1.2'
	14					6	WATER ADDED TO HOLE TO RETRIEVE SAMPLE.

HTW DRILLING LOG

HOLE NO.
WT117A
SHEET 3 OF 3 SHEETS

PROJECT HIMCO DUMP SUPERFUND SITE	INSPECTOR MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
						4	
	15						
	16						
	17						
		BOTTOM OF HOLE @ 17.5'					
	18						

ELEVATION GROUND WATER	PROJECT Himco Dump Superfund Site
DATE INSTALLED — STARTED 8-15-95 — COMPLETED 8-17-95	LOCATION (Coordinates or Station) N. 1532201.98 E. 405908.93
ELEVATION TOP OF HOLE Riser - 767.19 Ground - 764.8	SIGNATURE OF INSPECTOR Michelle Benak
TOTAL DEPTH OF HOLE 17.5 ft.	HOLE NO. WT117A

MONITORING WELL CONSTRUCTION DIAGRAM

(ALL MEASUREMENTS FROM GROUND SURFACE)

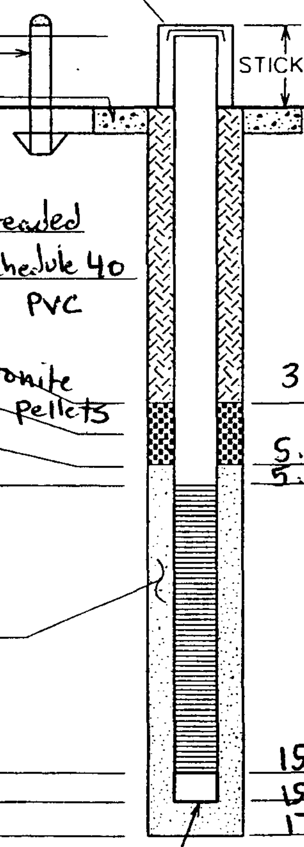
PROTECTIVE CASING
TYPE OF PROTECTIVE CASING: 4-inch square steel w/ hinged locking cap

TOP OF WELL

PROTECTIVE POSTS

CONCRETE PAD 4'X4'X4"

STICK-UP 2.4 ft. GROUND SURFACE



CASING DIAMETER: 2 in.

TYPE OF PIPE JOINTS: threaded

LENGTH OF SOLID PIPE 7.9 ft.

TYPE OF BLANK CASING: Schedule 40 PVC

TOP OF SEAL 3.0 ft.

TYPE OF SEAL: 3/8" bentonite pellets

TOP OF FILTERPACK 5.0 ft.

TOP OF SCREEN 5.5 ft.

WELL SCREEN LENGTH 10 ft.

FILTERPACK

BOTTOM OF SCREEN 15.5 ft.

BOTTOM OF WELL 15.7 ft.

BOTTOM OF BORING 17.5 ft.

WELL PLUG

SCREEN INFORMATION

SCREEN DIA.: 2 in.
SLOT WIDTH: 0.020 in.
SCHEDULE: 40
MATERIAL: ☒ PVC ☐ STAINLESS STEEL ☐ OTHER (DESCRIBE)

FILTERPACK MATERIAL
TYPE: 16-30 Colorado Silica
BACKFILL METHOD: Poured down annular space between riser and augers.

WATER LEVEL SUMMARY

WATER LEVEL MEASUREMENTS
DATE/TIME/LEVEL 8-18-95 11:00 AM 11.3 ft.

GEOLIB:MISCDIA1.DGN

HTW DRILLING LOG

1. COMPANY NAME U.S. ARMY CORPS OF ENGINEERS	2. DRILLING SUBCONTRACTOR N/A	HOLE NO. WT117B SHEET 1 OF 8 SHEETS
3. PROJECT HIMCO DUMP SUPERFUND SITE	4. LOCATION ELKHART, IN.	
5. NAME OF DRILLER JOE MORRISSEY	6. MANUFACTURER'S DESIGNATION OF DRILL GUS PECH 1100C	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT 6 1/4" I.D. HSA; 2" O.D. CARBON STEEL SPLIT SPOON SAMPLER DRIVEN BY A 140 POUND HAMMER FOR SPT; HNU P1101 PID; 1STMX 410 CGI.	8. HOLE LOCATION 9. SURFACE ELEVATION 10. DATE STARTED 8-14-95 11. DATE COMPLETED 8-14-95	
12. OVERBURDEN THICKNESS UNKNOWN	15. DEPTH GROUNDWATER ENCOUNTERED 11.5'	
13. DEPTH DRILLED INTO ROCK N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED 8-15-95 7:51AM 11.0' 8-18-95 11:54AM 10.3'	
14. TOTAL DEPTH OF HOLE 65.0'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	1		

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
						%

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		2" PVC		MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO. e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	0		BACKGROUND HNU = 3.2 UNITS O_2 = 20.9% LEL = 0%				
	1						
	2						
	3						
		POORLY GRADED SAND (SP): LOOSE, MOIST, LIGHT BROWN, FINE TO COARSE SAND, OUTWASH DEPOSITS.				2	N = 6 REC. = 1.5'
	4					3	
	5					3	

HTW DRILLING LOG

HOLE NO. WT117B

PROJECT: HIMCO DUMP SUPERFUND SITE | INSPECTOR: MICHELLE BENAK | SHEET 2 OF 8 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	6						
	7						
	8						
	8.5	WELL GRADED SAND (SW): LOOSE, MOIST, LIGHT BROWN, MEDIUM TO COARSE SAND, OUTWASH DEPOSITS.	BREATHING ZONE HNU = 3.0 UNITS O_2 = 20.9% LEL = 0%			3	N = 8 REC. = 1.4'
	9					4	
	9.5					4	
	10						
	11						
▽	11.5						WATER MEASURED @ 11.5'
	12						
	13						
	13.5	WELL GRADED SAND (SW): SAME AS THE INTERVAL FROM 8.5'-10.0' EXCEPT MEDIUM DENSE, WET, COARSER GRAINED, 5% GRAVEL.	BREATHING ZONE HNU = 2.5 UNITS O_2 = 20.9% LEL = 0%			1	N = 12 REC. = 1.5'
	14					4	

HTW DRILLING LOG

HOLE NO.	SHEET	PROJECT	INSPECTOR
WT117B	SHEET 4 OF 8 SHEETS	HIMCO DUMP SUPERFUND SITE	MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
						2	N = 8 REC. = 0.8'
						6	
	25						
	26						
	27						
	28						
		WELL GRADED SAND WITH GRAVEL (SW): SAME AS THE INTERVAL FROM 23.5'-25.0'.	BREATHING ZONE HNU = 1.8 UNITS O_2 = 20.9% LEL = 0%			3	N = 18 REC. = 1.4'
	29	WELL GRADED GRAVEL (GW): WET, GREY, COARSE GRAVEL, OUTWASH DEPOSITS.				4	
		WELL GRADED SAND WITH GRAVEL (SW): SAME AS THE INTERVAL FROM 23.5'-25.0'.				14	
	30						
	31						
	32	- - - - - - - -					
	33						

HTW DRILLING LOG

HOLE NO.	SHEET	PROJECT	INSPECTOR
WT117B	5 OF 8 SHEETS	HIMCO DUMP SUPERFUND SITE	MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	34	WELL GRADED SAND (SW): MEDIUM DENSE, WET, GREY, FINE TO COARSE SAND, OUTWASH DEPOSITS.	BREATHING ZONE HNU = 1.6 UNITS O_2 = 20.9% LEL = 0%			3 6 8	N = 14 REC. = 1.5'
	35						
	36						
	37						
	38						
	39	WELL GRADED SAND (SW): SAME AS THE INTERVAL FROM 33.5'-35.0' EXCEPT DENSE, 5% GRAVEL.	BREATHING ZONE HNU = 1.8 UNITS O_2 = 20.9% LEL = 0%			4 10 27	N = 37 REC. = 1.5'
	40						
	41						
	42						
	43						

HTW DRILLING LOG

HOLE NO.	PROJECT	INSPECTOR	SHEET
WT117B	HIMCO DUMP SUPERFUND SITE	MICHELLE BENAK	6 OF 8 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	44	WELL GRADED GRAVEL (GW): LOOSE, WET, GREY, FINE TO COARSE GRAVEL, OUTWASH DEPOSITS.	BREATHING ZONE HNU = 1.6 UNITS O_2 = 20.9% LEL = 0%			5 4 4	N = 8 REC. = 1.2′
	45						
	46						
	47						
	48						
	49	WELL GRADED GRAVEL (GW): SAME AS THE INTERVAL FROM 43.5′-45.0′ EXCEPT MEDIUM DENSE.	BREATHING ZONE HNU = 1.5 UNITS O_2 = 20.9% LEL = 0%			10 5 7	N = 12 REC. = 1.1′
	50						
	51						
	52						

HTW DRILLING LOG

HOLE NO.	SHEET	OF
WT117B	7	8 SHEETS

PROJECT: HIMCO DUMP SUPERFUND SITE

INSPECTOR: MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	53						
	53.5–54	POORLY GRADED SAND WITH GRAVEL (SP): DENSE, WET, GREY, FINE TO COARSE SAND, 15%-20% GRAVEL, OUTWASH DEPOSITS.	BREATHING ZONE HNU = 1.6 UNITS O_2 = 20.9% LEL = 0%			19	N = 34 REC. = 0.6′
	54–54.5					22	
	54.5–55					12	
	55						
	56						
	57	- - - - - - - - - -					
	58						
	58.5–59	WELL GRADED GRAVEL (GW): LOOSE, WET, GREY, FINE TO COARSE GRAVEL. OUTWASH DEPOSITS.	BREATHING ZONE HNU = 1.6 UNITS O_2 = 20.9% LEL = 0%			4	N = 7 REC. = 0.9′
	59–59.5					4	
	59.5–60					3	
	60						
	61						
	62						

HTW DRILLING LOG

HOLE NO.	SHEET	
WT117B	8	OF 8 SHEETS

PROJECT	INSPECTOR
HIMCO DUMP SUPERFUND SITE	MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	63						
		WELL GRADED GRAVEL (GW): SAME AS THE INTERVAL FROM 58.5'-60.0'.	BREATHING ZONE HNU = 0.5 UNITS O_2 = 20.9% LEL = 0%			1	N = 7 REC. = 1.5'
	64					4	
						3	
	65	BOTTOM OF HOLE @ 65.0'					THE MONITORING WELL SET IN THIS BORING WAS ABANDONED DUE TO NON-COMPLIANCE WITH THE FIELD SAMPLING PLAN. A NEW BORING LOCATED 10.0' SOUTH OF THE ORIGINAL BORING WAS AUGERED DOWN TO 62.5' BELOW GROUND SURFACE AND A NEW MONITORING WELL WAS INSTALLED.
	66						
	67						

ELEVATION GROUND WATER			PROJECT Kimco Dump Superfund Site
DATE INSTALLED	STARTED 8-14-95	COMPLETED 8-17-95	LOCATION (Coordinates or Station) N. 1532202.51 E. 405896.41
ELEVATION TOP OF HOLE Riser - 766.60 Ground - 764.4			SIGNATURE OF INSPECTOR Michelle Benak
TOTAL DEPTH OF HOLE 62.5 ft.			HOLE NO. WT117B

MONITORING WELL CONSTRUCTION DIAGRAM

(ALL MEASUREMENTS FROM GROUND SURFACE)

PROTECTIVE CASING

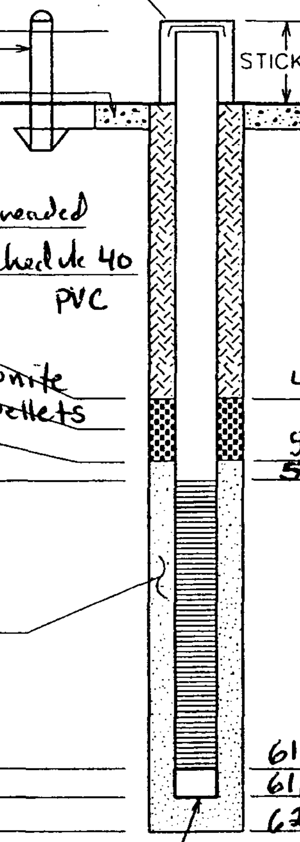
TYPE OF PROTECTIVE CASING: 4-inch square steel w/ hinged locking cap

TOP OF WELL

PROTECTIVE POSTS

CONCRETE PAD 4'X4'X4"

STICK-UP 2.2 ft. GROUND SURFACE



CASING DIAMETER: 2 in.

TYPE OF PIPE JOINTS: threaded

LENGTH OF SOLID PIPE 58.5 ft.

TYPE OF BLANK CASING: Schedule 40 PVC

TOP OF SEAL 48.0 ft.

TYPE OF SEAL: 3/8" bentonite pellets

TOP OF FILTERPACK 53.0 ft.

TOP OF SCREEN 56.3 ft.

WELL SCREEN LENGTH 5 ft.

FILTERPACK

BOTTOM OF SCREEN 61.3 ft.

BOTTOM OF WELL 61.5 ft.

BOTTOM OF BORING 62.5 ft.

WELL PLUG

SCREEN INFORMATION

SCREEN DIA.: 2 in.

SLOT WIDTH: 0.020 in.

SCHEDULE: 40

MATERIAL: ☒ PVC ☐ STAINLESS STEEL ☐ OTHER (DESCRIBE)

FILTERPACK MATERIAL

TYPE: 16-30 Colorado Silica

BACKFILL METHOD: Poured down annular space between riser and augers.

WATER LEVEL SUMMARY

WATER LEVEL MEASUREMENTS

DATE/TIME/LEVEL
8-14-95 8:25 AM 11.5 ft.
8-15-95 7:51 AM 11.0 ft.
8-18-95 11:54 AM 10.3 ft.

HTW DRILLING LOG

HOLE NO. WT118B

1. COMPANY NAME U.S. ARMY CORPS OF ENGINEERS	2. DRILLING SUBCONTRACTOR N/A	SHEET 1 OF 8 SHEETS
3. PROJECT HIMCO DUMP SUPERFUND SITE	4. LOCATION ELKHART, IN.	
5. NAME OF DRILLER JOE MORRISSEY	6. MANUFACTURER'S DESIGNATION OF DRILL GUS PECH 1100C	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT 6 1/4" I.D. HSA; 2" O.D. CARBON STEEL SPLIT SPOON SAMPLER DRIVEN BY A 140 POUND HAMMER FOR SPT; HNU P1101 PID; 1STMX 410 CGI.	8. HOLE LOCATION 9. SURFACE ELEVATION	
	10. DATE STARTED 8-18-95	11. DATE COMPLETED 8-18-95
12. OVERBURDEN THICKNESS UNKNOWN	15. DEPTH GROUNDWATER ENCOUNTERED 12.0'	
13. DEPTH DRILLED INTO ROCK N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED 8-21-95 9:24AM 11.0'	
14. TOTAL DEPTH OF HOLE 63.5'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	1		

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
						%

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		2" PVC		MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO. e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	0	TOPSOIL - WEEDS	BACKGROUND HNU = 0.2 UNITS O_2 = 20.8% LEL = 0%				
	1						
	2						
	3	POORLY GRADED SAND WITH SILT (SP-SM): MOIST, BROWN, OUTWASH DEPOSITS.	BREATHING ZONE HNU = 0.0 UNITS O_2 = 20.9% LEL = 0%				
	4	POORLY GRADED SAND (SP): LOOSE, MOIST, LIGHT BROWN, MEDIUM TO COARSE SAND, OUTWASH DEPOSITS.				2 2 3	N = 5 REC. = 1.5'
	5						

HTW DRILLING LOG

PROJECT	INSPECTOR	HOLE NO. / SHEET
HIMCO DUMP SUPERFUND SITE	MICHELLE BENAK	HOLE NO. WT118B; SHEET 2 OF 8 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	6						
	7						
	8						
		POORLY GRADED SAND (SP): SAME AS THE INTERVAL FROM 3.7'-5.0' EXCEPT TAN.	BREATHING ZONE HNU = 0.0 UNITS O_2 = 21.0% LEL = 0%			2	N = 5 REC. = 1.5'
	9	POORLY GRADED SAND (SP): LOOSE, MOIST, TAN, FINE SAND, OUTWASH DEPOSITS.				2	
						3	
	10						
	11						
▽	12						WATER MEASURED @ 12.0'
	13						
		POORLY GRADED SAND (SP): SAME AS THE INTERVAL FROM 9.1'-10.0' EXCEPT WET.	BREATHING ZONE HNU = 0.2 UNITS O_2 = 20.9% LEL = 0%				N = 1 (ONE 6" INTERVAL ONLY) REC. = 1.5'
	14						

HTW DRILLING LOG

HOLE NO.	SHEET	PROJECT	INSPECTOR
WT118B	3 OF 8 SHEETS	HIMCO DUMP SUPERFUND SITE	MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	15					1	
	16						
	17						
	18						
	19	POORLY GRADED SAND (SP): SAME AS THE INTERVAL FROM 9.1'-10.0' EXCEPT WET.	BREATHING ZONE HNU = 0.1 UNITS O_2 = 20.9% LEL = 0%				N = 1 (ONE 6" INTERVAL ONLY) REC. = 1.5'
		POORLY GRADED SAND WITH GRAVEL (SP): WET, GREY, MEDIUM TO COARSE SAND, 20%-25% GRAVEL, OUTWASH DEPOSITS.				1	
	20						
	21						
	22						
	23		BREATHING ZONE HNU = 0.1 UNITS O_2 = 20.9% LEL = 0%				
	24	POORLY GRADED SAND WITH GRAVEL (SP): SAME AS THE INTERVAL FROM 19.1'-20.0' EXCEPT LOOSE.				1	

HTW DRILLING LOG

HOLE NO.	SHEET	OF
WT118B	4	8 SHEETS

PROJECT: HIMCO DUMP SUPERFUND SITE

INSPECTOR: MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
						2	N = 4 REC. = 0.9′
						2	
	25						
	26						
	27						
	28						
		WELL GRADED GRAVEL (GW): MEDIUM DENSE, WET, GREY, FINE TO COARSE GRAVEL. OUTWASH DEPOSITS.	BREATHING ZONE HNU = 0.1 UNITS O_2 = 20.9% LEL = 0%			5	N = 17 REC. = 1.5′
	29					6	
						11	
	30						
	31						
	32						
	33						

HTW DRILLING LOG

HOLE NO.	SHEET	PROJECT	INSPECTOR
WT118B	5 OF 8 SHEETS	HIMCO DUMP SUPERFUND SITE	MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	33.5–35	WELL GRADED GRAVEL (GW): SAME AS THE INTERVAL FROM 28.5'-30.0' EXCEPT LOOSE.	BREATHING ZONE HNU = 0.0 UNITS O_2 = 21.0% LEL = 0%			4 5 4	N = 9 REC. = 1.3'
	38.5–40	WELL GRADED GRAVEL (GW): SAME AS THE INTERVAL FROM 28.5'-30.0'.	BREATHING ZONE HNU = 0.2 UNITS O_2 = 20.9% LEL = 0%			6 8 7	N = 15 REC. = 1.5'

Depth scale: 34, 35, 36, 37, 38, 39, 40, 41, 42, 43

HTW DRILLING LOG

HOLE NO.	SHEET	PROJECT	INSPECTOR
WT118B	6 OF 8 SHEETS	HIMCO DUMP SUPERFUND SITE	MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	44	WELL GRADED GRAVEL (GW): SAME AS THE INTERVAL FROM 28.5'-30.0' EXCEPT DENSE.	BREATHING ZONE HNU = 0.2 UNITS O_2 = 20.9% LEL = 0%			10 17 25	N = 42 REC. = 1.1'
	45						
	46						
	47						
	48						
	49	WELL GRADED GRAVEL (GW): SAME AS THE INTERVAL FROM 28.5'-30.0'.	BREATHING ZONE HNU = 0.2 UNITS O_2 = 21.0% LEL = 0%			6 8 7	N = 15 REC. = 1.0'
	50						
	51						
	52						

HTW DRILLING LOG

HOLE NO.	SHEET	
WT118B	7	OF 8 SHEETS

PROJECT: HIMCO DUMP SUPERFUND SITE
INSPECTOR: MICHELLE BENAK

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	53						
	53.5–55.0	POORLY GRADED SAND WITH GRAVEL (SP): MEDIUM DENSE, WET, GREY, MEDIUM TO COARSE SAND, 25%-30% GRAVEL, OUTWASH DEPOSITS.	BREATHING ZONE HNU = 0.2 UNITS O_2 = 20.9% LEL = 0%			7 9 13	N = 22 REC. = 1.2′
	55						
	56						
	57						
	58						
	58.5–60.0	POORLY GRADED SAND WITH GRAVEL (SP): SAME AS THE INTERVAL FROM 53.5′-55.0′.	BREATHING ZONE HNU = 0.2 UNITS O_2 = 21.0% LEL = 0%	D-1		13 10 12	N = 22 REC. = 1.3′
	60						
	61						
	62						

HTW DRILLING LOG

HOLE NO.
WT118B

PROJECT	INSPECTOR	SHEET 8
HIMCO DUMP SUPERFUND SITE	MICHELLE BENAK	OF 8 SHEETS

ELEV. a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.
	63						
		BOTTOM OF HOLE @ 63.5'					
	64						
	65						

ELEVATION GROUND WATER			PROJECT Himco Dump Superfund Site
DATE INSTALLED	STARTED 8-18-95	COMPLETED 8-21-95	LOCATION (Coordinates or Station) N. 1531917.55 E. 406361.16
ELEVATION TOP OF HOLE Riser - 766.49 Ground - 764.1			SIGNATURE OF INSPECTOR Michelle Bendk
TOTAL DEPTH OF HOLE 63.5 ft.			HOLE NO. WT118B

MONITORING WELL CONSTRUCTION DIAGRAM

(ALL MEASUREMENTS FROM GROUND SURFACE)

PROTECTIVE CASING

TYPE OF PROTECTIVE CASING: 4-inch square steel w/ hinged locking cap

TOP OF WELL

PROTECTIVE POSTS

CONCRETE PAD 4'X4'X4"

STICK-UP 2.4 ft. GROUND SURFACE

CASING DIAMETER: 2 in.

TYPE OF PIPE JOINTS: threaded

TYPE OF BLANK CASING: Schedule 40 PVC

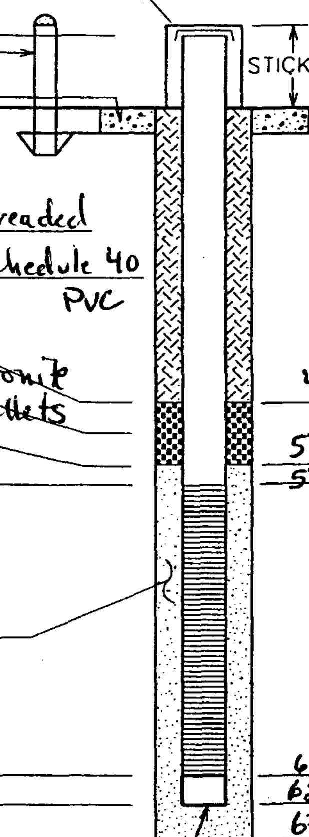
LENGTH OF SOLID PIPE 59.9 ft.

TOP OF SEAL 47.4 ft.

TYPE OF SEAL: 3/8" bentonite pellets

TOP OF FILTERPACK 54.7 ft.

TOP OF SCREEN 57.5 ft.



WELL SCREEN LENGTH 5 ft.

FILTERPACK

BOTTOM OF SCREEN 62.5 ft.

BOTTOM OF WELL 62.7 ft.

BOTTOM OF BORING 63.5 ft.

WELL PLUG

SCREEN INFORMATION

SCREEN DIA.: 2 in.

SLOT WIDTH: 0.020 in.

SCHEDULE: 40

MATERIAL: ☒ PVC ☐ STAINLESS STEEL ☐ OTHER (DESCRIBE)

FILTERPACK MATERIAL

TYPE: 16-30 Colorado Silica

BACKFILL METHOD: Poured down annular space between riser and augers.

WATER LEVEL SUMMARY

WATER LEVEL MEASUREMENTS

DATE/TIME/LEVEL 8-18-95 2:22 PM 12.0 ft.
8-21-95 9:24 Am 11.0 ft.

Appendix K

Intake and Risk Calculation Spreadsheets

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel M
Construction Worker/Ingestion of Total Soil
Intake (mg/kg-day)= (Cs x IR x EF x ED x CF x FI/BW x AT)

IR (mg/day)	480
EF (days/year)	180
ED (years)	0.75
CF (kg/mg)	0.000001
FI (unitless)	1
BW - adult (kg)	70
AT noncarc (days)	266
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	Intake Noncarc	Intake Carc	RfDo (mg/kg-d)	SFo (kg-d/mg)	Hazard Quotient Oral	Carc Risk Oral
Aluminum	4080	1.42E-02	1.48E-04	1.00E+00		1.42E-02	
Antimony	5.75	2.00E-05	2.08E-07	4.00E-04		5.00E-02	
Arsenic	1.6	5.57E-06	5.80E-08	3.00E-04	1.50E+00	1.86E-02	8.70E-08
Copper	15.9	5.53E-05	5.76E-07	4.00E-02		1.38E-03	
Manganese	58.7	2.04E-04	2.13E-06	4.70E-02		4.35E-03	
Mercury	0.03	1.04E-07	1.09E-09	3.00E-04		3.48E-04	
Nickel	4.2	1.46E-05	1.52E-07	2.00E-02		7.31E-04	
Benzo(a)anthracene	0.180	6.26E-07	6.52E-09		7.30E-01		4.76E-09
Benzo(b)fluoranthene	0.180	6.26E-07	6.52E-09		7.30E-01		4.76E-09
Benzo(k)fluoranthene	0.180	6.26E-07	6.52E-09		7.30E-02		4.76E-10
Benzo(a)pyrene	0.180	6.26E-07	6.52E-09		7.30E+00		4.76E-08
Indeno(1,2,3-cd)pyrene	0.180	6.26E-07	6.52E-09		7.30E-01		4.76E-09
Dibenz(a,h)anthracene	0.180	6.26E-07	6.52E-09		7.30E+00		4.76E-08

Exposure Route Hazard Index: 0.09

Exposure Route Cancer Risk: 1.97E-07

wired parMrk / CWING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel M
Construction Worker/Dermal Exposure to Total Soil
Intake (mg/kg-day) = (CS x CF x SA x AF x ABS x EF x ED)/(BW x AT)

SA RME - (cm2)	2000
AF (mg/cm^2)	1
EF (events/year)	180
ED (years)	0.75
CF (kg/mg)	0.000001
BW - adult (kg)	70
AT noncarc (days)	266
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	ABS	Intake Noncarc	Intake Carc	RfDd mg/kg-d	SFd kg-d/mg	Hazard Quotient Derm	Carc Risk Derm
Aluminum	4080	0.01	5.92E-04	6.16E-06	2.70E-01		2.19E-03	
Antimony	5.75	0.01	8.34E-07	8.68E-09	6.00E-05		1.39E-02	
Arsenic	1.6	0.03	6.96E-07	7.25E-09	3.00E-04	1.50E+00	2.32E-03	1.09E-08
Copper	15.9	0.01	2.31E-06	2.40E-08	4.00E-02		5.76E-05	
Manganese	58.7	0.01	8.51E-06	8.86E-08	1.88E-03		4.53E-03	
Mercury	0.03	0.01	4.35E-09	4.53E-11	2.10E-05		2.07E-04	
Nickel	4.2	0.01	6.09E-07	6.34E-09	8.00E-04		7.61E-04	
Benzo(a)anthracene	0.180	0.13	3.39E-07	3.53E-09		7.30E-01		2.58E-09
Benzo(b)fluoranthene	0.180	0.13	3.39E-07	3.53E-09		7.30E-01		2.58E-09
Benzo(k)fluoranthene	0.180	0.13	3.39E-07	3.53E-09		7.30E-02		2.58E-10
Benzo(a)pyrene	0.180	0.13	3.39E-07	3.53E-09		7.30E+00		2.58E-08
Indeno(1,2,3-cd)pyrene	0.180	0.13	3.39E-07	3.53E-09		7.30E-01		2.58E-09
Dibenz(a,h)anthracene	0.180	0.13	3.39E-07	3.53E-09		7.30E+00		2.58E-08
					Exposure Route Hazard Index:		0.02	
						Exposure Route Cancer Risk:		7.04E-08

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel M
Construction Worker/Inhalation of Total Soil
Intake (mg/kg-day)= (Cs x IR x EF x ED/BW x AT x (VF/PEF))

IR (m3/day)	20
EF (days/year)	180
ED (years)	0.75
BW - adult (kg)	70
AT noncarc (days)	266
AT carc (days)	25,550

	Conc. Soil	VF/PEF	Intake		RfDi	Sfi	Hazard Quotient	Carc Risk
Analyte	**(mg/kg)**	**m3/kg**	**Noncarc**	**Carc**	**(mg/kg-d)**	**(kg-d/mg)**	**Inhalation**	**Inhalation**
Aluminum	4080	1.42E+09	4.17E-07	4.34E-09	1.00E-03		4.17E-04	
Antimony	5.75	1.42E+09	5.87E-10	6.11E-12				
Arsenic	1.6	1.42E+09	1.63E-10	1.70E-12		1.51E+01		2.57E-11
Copper	15.9	1.42E+09	1.62E-09	1.69E-11				
Manganese	58.7	1.42E+09	5.99E-09	6.24E-11	1.43E-05		4.19E-04	
Mercury	0.03	1.42E+09	3.06E-12	3.19E-14	8.60E-05		3.56E-08	
Nickel	4.2	1.42E+09	4.29E-10	4.47E-12				
Benzo(a)anthracene	0.180	1.42E+09	1.84E-11	1.91E-13				
Benzo(b)fluoranthene	0.180	1.42E+09	1.84E-11	1.91E-13				
Benzo(k)fluoranthene	0.180	1.42E+09	1.84E-11	1.91E-13				
Benzo(a)pyrene	0.180	1.42E+09	1.84E-11	1.91E-13				
Indeno(1,2,3-cd)pyrene	0.180	1.42E+09	1.84E-11	1.91E-13				
Dibenz(a,h)anthracene	0.180	1.42E+09	1.84E-11	1.91E-13				

Exposure Route Hazard Index: 8.4E-04

Exposure Route Cancer Risk: 2.57E-11

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel M
Gardener (age-adjusted)/Ingestion of Soils - 0-2'
Intake (mg/kg-day)= (Cs x IFSadj x EF x CF x FI)/(AT)

IFS adj (mg-yr/kg)	245
EF (days/year)	40
CF (kg/mg)	0.000001
FI (unitless)	1
AT carc (days)	25550

Analyte	Conc. Soil (mg/kg)	Intake Carc	SFo (kg-d/mg)	Carc Risk Oral
Aluminum	4080	1.56E-03		
Antimony	5.75	2.21E-06		
Arsenic	1.6	6.14E-07	1.50E+00	9.21E-07
Copper	15.9	6.10E-06		
Manganese	58.7	2.25E-05		
Mercury	0.03	1.15E-08		
Nickel	4.2	1.61E-06		
Benzo(a)anthracene	0.180	6.90E-08	7.30E-01	5.04E-08
Benzo(b)fluoranthene	0.180	6.90E-08	7.30E-01	5.04E-08
Benzo(k)fluoranthene	0.180	6.90E-08	7.30E-02	5.04E-09
Benzo(a)pyrene	0.180	6.90E-08	7.30E+00	5.04E-07
Indeno(1,2,3-cd)pyrene	0.180	6.90E-08	7.30E-01	5.04E-08
Dibenz(a,h)anthracene	0.180	6.90E-08	7.30E+00	5.04E-07
			Exposure Route Cancer Risk:	**2.08E-06**

wired parMrk / AGCING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel M
Child Gardener/Ingestion of Soils - 0-2'
Intake (mg/kg-day)= (Cs x IR x EF x ED x CF x FI/BW x AT)

IR (mg/day)	200
EF (days/year)	40
ED (years)	6
CF (kg/mg)	0.000001
FI (unitless)	1
BW - child (kg)	15
AT noncarc (days)	2190
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	Intake Noncarc	RfDo (mg/kg-d)	Hazard Quotient Oral
Aluminum	4080	5.96E-03	1.00E+00	5.96E-03
Antimony	5.75	8.40E-06	4.00E-04	2.10E-02
Arsenic	1.6	2.34E-06	3.00E-04	7.79E-03
Copper	15.9	2.32E-05	4.00E-02	5.81E-04
Manganese	58.7	8.58E-05	4.70E-02	1.82E-03
Mercury	0.03	4.38E-08	3.00E-04	1.46E-04
Nickel	4.2	6.14E-06	2.00E-02	3.07E-04
Benzo(a)anthracene	0.180	2.63E-07		
Benzo(b)fluoranthene	0.180	2.63E-07		
Benzo(k)fluoranthene	0.180	2.63E-07		
Benzo(a)pyrene	0.180	2.63E-07		
Indeno(1,2,3-cd)pyrene	0.180	2.63E-07		
Dibenz(a,h)anthracene	0.180	2.63E-07		
			Exposure Route Hazard Index:	**0.04**

wired parMrk / CGNING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel M
Garderner (age-adjusted)/Dermal Exposure to Soils - 0-2'
Intake (mg/kg-day)= (Cs x SFSadj x ABS x AF x EF x CF) /(AT)

SFS adj - (cm2-yr/kg)	2720
AF (mg/cm^2)	1
EF (days/year)	40
CF (kg/mg)	0.000001
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	ABS	Intake Carc	SFd kg-d/mg	Carc Risk Derm
Aluminum	4080	0.01	1.74E-04		
Antimony	5.75	0.01	2.45E-07		
Arsenic	1.6	0.03	2.04E-07	1.50E+00	3.07E-07
Copper	15.9	0.01	6.77E-07		
Manganese	58.7	0.01	2.50E-06		
Mercury	0.03	0.01	1.28E-09		
Nickel	4.2	0.01	1.79E-07		
Benzo(a)anthracene	0.180	0.13	9.96E-08	7.30E-01	7.27E-08
Benzo(b)fluoranthene	0.180	0.13	9.96E-08	7.30E-01	7.27E-08
Benzo(k)fluoranthene	0.180	0.13	9.96E-08	7.30E-02	7.27E-09
Benzo(a)pyrene	0.180	0.13	9.96E-08	7.30E+00	7.27E-07
Indeno(1,2,3-cd)pyrene	0.180	0.13	9.96E-08	7.30E-01	7.27E-08
Dibenz(a,h)anthracene	0.180	0.13	9.96E-08	7.30E+00	7.27E-07
				Exposure Route Cancer Risk	**1.99E-06**

wired parMrk / AGCDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel M
Child Gardener/Dermal Exposure to Soils - 0-2'
Intake (mg/kg-day) = (CS x CF x SA x AF x ABS x EF x ED)/ (BW x AT)

SA RME - (cm2)	1825
AF (mg/cm^2)	1
EF (days/year)	40
ED (years)	6
CF (kg/mg)	0.000001
BW - child (kg)	15
AT noncarc (days)	2190

Analyte	Conc. Soil (mg/kg)	ABS	Intake Noncarc	RfDd mg/kg-d	Hazard Quotient Derm
Aluminum	4080	0.01	5.44E-04	2.70E-01	2.01E-03
Antimony	5.75	0.01	7.67E-07	6.00E-05	1.28E-02
Arsenic	1.6	0.03	6.40E-07	3.00E-04	2.13E-03
Copper	15.9	0.01	2.12E-06	4.00E-02	5.30E-05
Manganese	58.7	0.01	7.83E-06	1.88E-03	4.16E-03
Mercury	0.03	0.01	4.00E-09	2.10E-05	1.90E-04
Nickel	4.2	0.01	5.60E-07	8.00E-04	7.00E-04
Benzo(a)anthracene	0.180	0.13	3.12E-07		
Benzo(b)fluoranthene	0.180	0.13	3.12E-07		
Benzo(k)fluoranthene	0.180	0.13	3.12E-07		
Benzo(a)pyrene	0.180	0.13	3.12E-07		
Indeno(1,2,3-cd)pyrene	0.180	0.13	3.12E-07		
Dibenz(a,h)anthracene	0.180	0.13	3.12E-07		
				Exposure Route Hazard Index:	**0.02**

wired parMrk / CGNDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel M
Resident (age-adjusted)/Ingestion of Surface Soil
Intake (mg/kg-day)= (Cs x IFSadj x EF x CF x FI)/(AT)

IFS adj (mg-yr/kg)	114
EF (days/year)	350
CF (kg/mg)	0.000001
FI (unitless)	1
AT carc (days)	25550

Analyte	Conc. Soil (mg/kg)	Intake Carc	SFo (kg-d/mg)	Carc Risk Oral
Antimony	5.75	8.98E-06		
Arsenic	1.6	2.50E-06	1.50E+00	3.75E-06
Copper	15.9	2.48E-05		
Manganese	58.7	9.17E-05		
Mercury	0.03	4.68E-08		
Benzo(a)anthracene	0.180	2.81E-07	7.30E-01	2.05E-07
Benzo(b)fluoranthene	0.180	2.81E-07	7.30E-01	2.05E-07
Benzo(a)pyrene	0.180	2.81E-07	7.30E+00	2.05E-06
Indeno(1,2,3-cd)pyrene	0.180	2.81E-07	7.30E-01	2.05E-07
Dibenz(a,h)anthracene	0.180	2.81E-07	7.30E+00	2.05E-06
			Exposure Route Cancer Risk:	**8.47E-06**

wired parMrk / ARCING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel M
Child Resident/Ingestion of Surface Soil
Intake (mg/kg-day)= (Cs x IR x EF x ED x CF x FI/BW x AT)

IR (mg/day)	200
EF (days/year)	350
ED (years)	6
CF (kg/mg)	0.000001
FI (unitless)	1
BW - child (kg)	15
AT noncarc (days)	2190

Analyte	Conc. Soil (mg/kg)	Intake Noncarc	RfDo (mg/kg-d)	Hazard Quotient Oral
Antimony	5.75	7.35E-05	4.00E-04	1.84E-01
Arsenic	1.6	2.05E-05	3.00E-04	6.82E-02
Copper	15.9	2.03E-04	4.00E-02	5.08E-03
Manganese	58.7	7.51E-04	4.70E-02	1.60E-02
Mercury	0.03	3.84E-07	3.00E-04	1.28E-03
Benzo(a)anthracene	0.180	2.30E-06		
Benzo(b)fluoranthene	0.180	2.30E-06		
Benzo(a)pyrene	0.180	2.30E-06		
Indeno(1,2,3-cd)pyrene	0.180	2.30E-06		
Dibenz(a,h)anthracene	0.180	2.30E-06		
			Exposure Route Hazard Index:	**0.27**

wired parMrk / CRNING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel M
Resident (age-adjusted)/Dermal Exposure to Surface Soil
Intake (mg/kg-day)= (Cs x SFSadj x ABS x AF x EF x CF) /(AT)

SFS adj - (cm2-yr/kg)	2720
AF (mg/cm^2)	1
EF (days/year)	350
CF (kg/mg)	0.000001
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	ABS	Intake Carc	SFd kg-d/mg	Carc Risk Derm
Antimony	5.75	0.01	2.14E-06		
Arsenic	1.6	0.03	1.79E-06	1.50E+00	2.68E-06
Copper	15.9	0.01	5.92E-06		
Manganese	58.7	0.01	2.19E-05		
Mercury	0.03	0.01	1.12E-08		
Benzo(a)anthracene	0.180	0.13	8.72E-07	7.30E-01	6.36E-07
Benzo(b)fluoranthene	0.180	0.13	8.72E-07	7.30E-01	6.36E-07
Benzo(a)pyrene	0.180	0.13	8.72E-07	7.30E+00	6.36E-06
Indeno(1,2,3-cd)pyrene	0.180	0.13	8.72E-07	7.30E-01	6.36E-07
Dibenz(a,h)anthracene	0.180	0.13	8.72E-07	7.30E+00	6.36E-06
				Exposure Route Cancer Risk:	**1.73E-05**

wired parMrk / ARCDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel M
Child Resident/Dermal Exposure to Surface Soil
Intake (mg/kg-day) = (CS x CF x SA x AF x ABS x EF x ED)/(BW x AT)

SA RME - (cm2)	1825
AF (mg/cm2)	1
EF (days/year)	350
ED (years)	6
CF (kg/mg)	0.000001
BW - child (kg)	15
AT noncarc (days)	2190

Analyte	Conc. Soil (mg/kg)	ABS	Intake Noncarc	RfDd mg/kg-d	Hazard Quotient Derm
Antimony	5.75	0.01	6.71E-06	6.00E-05	1.12E-01
Arsenic	1.6	0.03	5.60E-06	3.00E-04	1.87E-02
Copper	15.9	0.01	1.86E-05	4.00E-02	4.64E-04
Manganese	58.7	0.01	6.85E-05	1.88E-03	3.64E-02
Mercury	0.03	0.01	3.50E-08	2.10E-05	1.67E-03
Benzo(a)anthracene	0.180	0.13	2.73E-06		
Benzo(b)fluoranthene	0.180	0.13	2.73E-06		
Benzo(a)pyrene	0.180	0.13	2.73E-06		
Indeno(1,2,3-cd)pyrene	0.180	0.13	2.73E-06		
Dibenz(a,h)anthracene	0.180	0.13	2.73E-06		
				Exposure Route Hazard Index:	**0.17**

wired parMrk / CRNDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel O
Construction Worker/Ingestion of Total Soil
Intake (mg/kg-day)= (Cs x IR x EF x ED x CFx FI/BW x AT)

IR (mg/day)	480
EF (days/year)	180
ED (years)	0.75
CF (kg/mg)	0.000001
FI (unitless)	1
BW - adult (kg)	70
AT noncarc (days)	266
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	Intake Noncarc	Intake Carc	RfDo (mg/kg-d)	SFo (kg-d/mg)	Hazard Quotient Oral	Carc Risk Oral
Aluminum	5130	1.79E-02	1.86E-04	1.00E+00		1.79E-02	
Antimony	5.15	1.79E-05	1.87E-07	4.00E-04		4.48E-02	
Arsenic	2.1	7.31E-06	7.61E-08	3.00E-04	1.50E+00	2.44E-02	1.14E-07
Copper	22.6	7.87E-05	8.19E-07	4.00E-02		1.97E-03	
Manganese	337	1.17E-03	1.22E-05	4.70E-02		2.50E-02	
Mercury	0.08	2.78E-07	2.9E-09	3.00E-04		9.28E-04	
Nickel	12.3	4.28E-05	4.46E-07	2.00E-02		2.14E-03	
Benzo(a)anthracene	0.210	7.31E-07	7.61E-09		7.30E-01		5.55E-09
Benzo(b)fluoranthene	0.210	7.31E-07	7.61E-09		7.30E-01		5.55E-09
Benzo(k)fluoranthene	0.210	7.31E-07	7.61E-09		7.30E-02		5.55E-10
Benzo(a)pyrene	0.210	7.31E-07	7.61E-09		7.30E+00		5.55E-08
Indeno(1,2,3-cd)pyrene	0.210	7.31E-07	7.61E-09		7.30E-01		5.55E-09
Dibenz(a,h)anthracene	0.210	7.31E-07	7.61E-09		7.30E+00		5.55E-08
				Exposure Route Hazard Index:		**0.12**	
					Exposure Route Cancer Risk:		**2.42E-07**

wired parOrk / CWING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel O
Construction Worker/Dermal Exposure to Total Soil
Intake (mg/kg-day) = (CS x CF x SA x AF x ABS x EF x ED)/ (BW x AT)

SA RME - (cm2)	2000
AF (mg/cm^2)	1
EF (events/year)	180
ED (years)	0.75
CF (kg/mg)	0.000001
BW - adult (kg)	70
AT noncarc (days)	266
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	ABS	Intake Noncarc	Intake Carc	RfDd mg/kg-d	SFd kg-d/mg	Hazard Quotient Derm	Carc Risk Derm
Aluminum	5130	0.01	7.44E-04	7.74E-06	2.70E-01		2.76E-03	
Antimony	5.15	0.01	7.47E-07	7.77E-09	6.00E-05		1.24E-02	
Arsenic	2.1	0.03	9.14E-07	9.51E-09	3.00E-04	1.50E+00	3.05E-03	1.43E-08
Copper	22.6	0.01	3.28E-06	3.41E-08	4.00E-02		8.19E-05	
Manganese	337	0.01	4.89E-05	5.09E-07	1.88E-03		2.60E-02	
Mercury	0.08	0.01	1.16E-08	1.21E-10	2.10E-05		5.52E-04	
Nickel	12.3	0.01	1.78E-06	1.86E-08	8.00E-04		2.23E-03	
Benzo(a)anthracene	0.210	0.13	3.96E-07	4.12E-09		7.30E-01		3.01E-09
Benzo(b)fluoranthene	0.210	0.13	3.96E-07	4.12E-09		7.30E-01		3.01E-09
Benzo(k)fluoranthene	0.210	0.13	3.96E-07	4.12E-09		7.30E-02		3.01E-10
Benzo(a)pyrene	0.210	0.13	3.96E-07	4.12E-09		7.30E+00		3.01E-08
Indeno(1,2,3-cd)pyrene	0.210	0.13	3.96E-07	4.12E-09		7.30E-01		3.01E-09
Dibenz(a,h)anthracene	0.210	0.13	3.96E-07	4.12E-09		7.30E+00		3.01E-08
					Exposure Route Hazard Index:		4.71E-02	
						Exposure Route Cancer Risk:		8.38E-08

wrred parOrk / CWDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel O
Construction Worker/Inhalation of Total Soil
Intake (mg/kg-day)= (Cs x IR x EF x ED/BW x AT x VF)

IR (m3/day)	20
EF (days/year)	180
ED (years)	0.75
BW - adult (kg)	70
AT noncarc (days)	266
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	VF/PEF m3/kg	Intake Noncarc	Intake Carc	RfDi (mg/kg-d)	SfI (kg-d/mg)	Hazard Quotient Inhalation	Carc Risk Inhalation
Aluminum	5130	1.42E+09	5.24E-07	5.45E-09	1.00E-03		5.24E-04	
Antimony	5.15	1.42E+09	5.26E-10	5.48E-12				
Arsenic	2.1	1.42E+09	2.14E-10	2.23E-12		1.51E+01		3.37E-11
Copper	22.6	1.42E+09	2.31E-09	2.40E-11				
Manganese	337	1.42E+09	3.44E-08	3.58E-10	1.43E-05		2.41E-03	
Mercury	0.08	1.42E+09	8.17E-12	8.51E-14	8.60E-05		9.50E-08	
Nickel	12.3	1.42E+09	1.26E-09	1.31E-11				
Benzo(a)anthracene	0.210	1.42E+09	2.14E-11	2.23E-13				
Benzo(b)fluoranthene	0.210	1.42E+09	2.14E-11	2.23E-13				
Benzo(k)fluoranthene	0.210	1.42E+09	2.14E-11	2.23E-13				
Benzo(a)pyrene	0.210	1.42E+09	2.14E-11	2.23E-13				
Indeno(1,2,3-cd)pyrene	0.210	1.42E+09	2.14E-11	2.23E-13				
Dibenz(a,h)anthracene	0.210	1.42E+09	2.14E-11	2.23E-13				

Exposure Route Hazard Index: 2.93E-03
Exposure Route Cancer Risk: 3.37E-11

wrod parOrk / CWIH

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel O
Gardener (age-adjusted)/Ingestion of Soils - 0-2'
Intake (mg/kg-day)= (Cs x IFSadj x EF x CF x FI)/(AT)

IFS adj (mg-yr/kg)	245
EF (days/year)	40
CF (kg/mg)	0.000001
FI (unitless)	1
AT carc (days)	25550

Analyte	Conc. Soil (mg/kg)	Intake Carc	SFo (kg-d/mg)	Carc Risk Oral
Aluminum	5130	1.97E-03		
Antimony	4.7	1.80E-06		
Arsenic	2.1	8.05E-07	1.50E+00	1.21E-06
Copper	22.6	8.67E-06		
Manganese	337	1.29E-04		
Mercury	0.08	3.07E-08		
Nickel	12.3	4.72E-06		
Benzo(a)anthracene	0.180	6.90E-08	7.30E-01	5.04E-08
Benzo(b)fluoranthene	0.180	6.90E-08	7.30E-01	5.04E-08
Benzo(k)fluoranthene	0.180	6.90E-08	7.30E-02	5.04E-09
Benzo(a)pyrene	0.180	6.90E-08	7.30E+00	5.04E-07
Indeno(1,2,3-cd)pyrene	0.180	6.90E-08	7.30E-01	5.04E-08
Dibenz(a,h)anthracene	0.180	6.90E-08	7.30E+00	5.04E-07
			Exposure Route Cancer Risk:	**2.37E-06**

wired parOrk / AGCING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel O
Child Gardener/Ingestion of Soils - 0-2'
Intake (mg/kg-day)= (Cs x IR x EF x ED x CF x FI/BW x AT)

IR (mg/day)	200
EF (days/year)	40
ED (years)	6
CF (kg/mg)	0.000001
FI (unitless)	1
BW - child (kg)	15
AT noncarc (days)	2190
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	Intake Noncarc	RfDo (mg/kg-d)	Hazard Quotient Oral
Aluminum	5130	7.50E-03	1.00E+00	7.50E-03
Antimony	4.7	6.87E-06	4.00E-04	1.72E-02
Arsenic	2.1	3.07E-06	3.00E-04	1.02E-02
Copper	22.6	3.30E-05	4.00E-02	8.26E-04
Manganese	337	4.92E-04	4.70E-02	1.05E-02
Mercury	0.08	1.17E-07	3.00E-04	3.90E-04
Nickel	12.3	1.80E-05	2.00E-02	8.99E-04
Benzo(a)anthracene	0.180	2.63E-07		
Benzo(b)fluoranthene	0.180	2.63E-07		
Benzo(k)fluoranthene	0.180	2.63E-07		
Benzo(a)pyrene	0.180	2.63E-07		
Indeno(1,2,3-cd)pyrene	0.180	2.63E-07		
Dibenz(a,h)anthracene	0.180	2.63E-07		
			Exposure Route Hazard Index:	**4.75E-02**

wired parOrk / CGNING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel O
Garderner (age-adjusted)/Dermal Exposure to Soils - 0-2'
Intake (mg/kg-day)= (Cs x SFSadj x ABS x AF x EF x CF) /(AT)

SFS adj - (cm2-yr/kg)	2720
AF (mg/cm^2)	1
EF (days/year)	40
CF (kg/mg)	0.000001
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	ABS	Intake Carc	SFd kg-d/mg	Carc Risk Derm
Aluminum	5130	0.01	2.18E-04		
Antimony	4.7	0.01	2.00E-07		
Arsenic	2.1	0.03	2.68E-07	1.50E+00	4.02E-07
Copper	22.6	0.01	9.62E-07		
Manganese	337	0.01	1.44E-05		
Mercury	0.08	0.01	3.41E-09		
Nickel	12.3	0.01	5.24E-07		
Benzo(a)anthracene	0.180	0.13	9.96E-08	7.30E-01	7.27E-08
Benzo(b)fluoranthene	0.180	0.13	9.96E-08	7.30E-01	7.27E-08
Benzo(k)fluoranthene	0.180	0.13	9.96E-08	7.30E-02	7.27E-09
Benzo(a)pyrene	0.180	0.13	9.96E-08	7.30E+00	7.27E-07
Indeno(1,2,3-cd)pyrene	0.180	0.13	9.96E-08	7.30E-01	7.27E-08
Dibenz(a,h)anthracene	0.180	0.13	9.96E-08	7.30E+00	7.27E-07
				Exposure Route Cancer Risk:	**2.08E-06**

wired parOrk / AGCDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel O
Child Gardener/Dermal Exposure to Soils - 0-2'
Intake (mg/kg-day) = (CS x CF x SA x AF x ABS x EF x ED)/(BW x AT)

SA RME - (cm2)	1825
AF (mg/cm$^{2)}$	1
EF (days/year)	40
ED (years)	6
CF (kg/mg)	0.000001
BW - child (kg)	15
AT noncarc (days)	2190

Analyte	Conc. Soil (mg/kg)	ABS	Intake Noncarc	RfDd mg/kg-d	Hazard Quotient Derm
Aluminum	5130	0.01	6.84E-04	2.70E-01	2.53E-03
Antimony	4.7	0.01	6.27E-07	6.00E-05	1.04E-02
Arsenic	2.1	0.03	8.40E-07	3.00E-04	2.80E-03
Copper	22.6	0.01	3.01E-06	4.00E-02	7.53E-05
Manganese	337	0.01	4.49E-05	1.88E-03	2.39E-02
Mercury	0.08	0.01	1.07E-08	2.10E-05	5.08E-04
Nickel	12.3	0.01	1.64E-06	8.00E-04	2.05E-03
Benzo(a)anthracene	0.180	0.13	3.12E-07		
Benzo(b)fluoranthene	0.180	0.13	3.12E-07		
Benzo(k)fluoranthene	0.180	0.13	3.12E-07		
Benzo(a)pyrene	0.180	0.13	3.12E-07		
Indeno(1,2,3-cd)pyrene	0.180	0.13	3.12E-07		
Dibenz(a,h)anthracene	0.180	0.13	3.12E-07		

Exposure Route Hazard Index: 4.23E-02

wired parOrk / CGNDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel O
Resident (age-adjusted)/Ingestion of Surface Soil
Intake (mg/kg-day)= (Cs x IFSadj x EF x CF x FI)/(AT)

IFS adj (mg-yr/kg)	114
EF (days/year)	350
CF (kg/mg)	0.000001
FI (unitless)	1
AT carc (days)	25550

Analyte	Conc. Soil (mg/kg)	Intake Carc	SFo (kg-d/mg)	Carc Risk Oral
Antimony	4.7	7.34E-06		
Arsenic	2.1	3.28E-06	1.50E+00	4.92E-06
Copper	20.4	3.19E-05		
Manganese	337	5.26E-04		
Mercury	0.08	1.25E-07		
Benzo(a)anthracene	0.180	2.81E-07	7.30E-01	2.05E-07
Benzo(b)fluoranthene	0.180	2.81E-07	7.30E-01	2.05E-07
Benzo(a)pyrene	0.180	2.81E-07	7.30E+00	2.05E-06
Indeno(1,2,3-cd)pyrene	0.180	2.81E-07	7.30E-01	2.05E-07
Dibenz(a,h)anthracene	0.180	2.81E-07	7.30E+00	2.05E-06
			Exposure Route Cancer Risk:	**9.64E-06**

wired parOrk / ARCING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel O
Child Resident/Ingestion of Surface Soil
Intake (mg/kg-day)= (Cs x IR x EF x ED x CF x FI/BW x AT)

IR (mg/day)	200
EF (days/year)	350
ED (years)	6
CF (kg/mg)	0.000001
FI (unitless)	1
BW - child (kg)	15
AT noncarc (days)	2190

Analyte	Conc. Soil (mg/kg)	Intake Noncarc	RfDo (mg/kg-d)	Hazard Quotient Oral
Antimony	4.7	6.01E-05	4.00E-04	1.50E-01
Arsenic	2.1	2.68E-05	3.00E-04	8.95E-02
Copper	20.4	2.61E-04	4.00E-02	6.52E-03
Manganese	337	4.31E-03	4.70E-02	9.17E-02
Mercury	0.08	1.02E-06	3.00E-04	3.41E-03
Benzo(a)anthracene	0.180	2.30E-06		
Benzo(b)fluoranthene	0.180	2.30E-06		
Benzo(a)pyrene	0.180	2.30E-06		
Indeno(1,2,3-cd)pyrene	0.180	2.30E-06		
Dibenz(a,h)anthracene	0.180	2.30E-06		
			Exposure Route Hazard Index:	**3.41E-01**

wired parOrk / CRNING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel O
Resident (age-adjusted)/Dermal Exposure to Surface Soil
Intake (mg/kg-day)= (Cs x SFSadj x ABS x AF x EF x CF) /(AT)

SFS adj - (cm2-yr/kg)	2720
AF (mg/cm^2)	1
EF (days/year)	350
CF (kg/mg)	0.000001
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	ABS	Intake Carc	SFd kg-d/mg	Carc Risk Derm
Antimony	4.7	0.01	1.75E-06		
Arsenic	2.1	0.03	2.35E-06	1.50E+00	3.52E-06
Copper	20.4	0.01	7.60E-06		
Manganese	337	0.01	1.26E-04		
Mercury	0.08	0.01	2.98E-08		
Benzo(a)anthracene	0.180	0.13	8.72E-07	7.30E-01	6.36E-07
Benzo(b)fluoranthene	0.180	0.13	8.72E-07	7.30E-01	6.36E-07
Benzo(a)pyrene	0.180	0.13	8.72E-07	7.30E+00	6.36E-06
Indeno(1,2,3-cd)pyrene	0.180	0.13	8.72E-07	7.30E-01	6.36E-07
Dibenz(a,h)anthracene	0.180	0.13	8.72E-07	7.30E+00	6.36E-06
				Exposure Route Cancer Risk:	**1.82E-05**

wired parOrk / ARCDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel O
Child Resident/Dermal Exposure to Surface Soil
Intake (mg/kg-day) = (CS x CF x SA x AF x ABS x EF x ED)/(BW x AT)

SA RME - (cm2)	1825
AF (mg/cm2)	1
EF (days/year)	350
ED (years)	6
CF (kg/mg)	0.000001
BW - child (kg)	15
AT noncarc (days)	2190

Analyte	Conc. Soil (mg/kg)	ABS	Intake Noncarc	RfDd mg/kg-d	Hazard Quotient Derm
Antimony	4.7	0.01	5.48E-06	6.00E-05	9.14E-02
Arsenic	2.1	0.03	7.35E-06	3.00E-04	2.45E-02
Copper	20.4	0.01	2.38E-05	4.00E-02	5.95E-04
Manganese	337	0.01	3.93E-04	1.88E-03	2.09E-01
Mercury	0.08	0.01	9.33E-08	2.10E-05	4.44E-03
Benzo(a)anthracene	0.180	0.13	2.73E-06		
Benzo(b)fluoranthene	0.180	0.13	2.73E-06		
Benzo(a)pyrene	0.180	0.13	2.73E-06		
Indeno(1,2,3-cd)pyrene	0.180	0.13	2.73E-06		
Dibenz(a,h)anthracene	0.180	0.13	2.73E-06		
				Exposure Route Hazard Index:	**3.30E-01**

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel N
Construction Worker/Ingestion of Total Soil
Intake (mg/kg-day)= (Cs x IR x EF x ED x CF x FI/BW x AT)

IR (mg/day)	480
EF (days/year)	180
ED (years)	0.75
CF (kg/mg)	0.000001
FI (unitless)	1
BW - adult (kg)	70
AT noncarc (days)	266
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	Intake Noncarc	Intake Carc	RfDo (mg/kg-d)	SFo (kg-d/mg)	Hazard Quotient Oral	Carc Risk Oral
Arsenic	1.88	6.54E-06	6.81E-08	3.00E-04	1.50E+00	2.18E-02	1.02E-07
Benzo(a)pyrene	0.180	6.26E-07	6.52E-09		7.30E+00		4.76E-08
				Exposure Route Hazard Index:		2.2E-02	
					Exposure Route Cancer Risk		1.50E-07

wired parNrk / CWING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel N
Construction Worker/Dermal Exposure to Total Soil
Intake (mg/kg-day) = (CS x CF x SA x AF x ABS x EF x ED)/(BW x AT)

SA RME - (cm2)	2000
AF (mg/cm^2)	1
EF (events/year)	180
ED (years)	0.75
CF (kg/mg)	0.000001
BW - adult (kg)	70
AT noncarc (days)	266
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	ABS	Intake Noncarc	Intake Carc	RfDd mg/kg-d	SFd kg-d/mg	Hazard Quotient Derm	Carc Risk Derm
Arsenic	1.88	0.03	8.18E-07	8.51E-09	3.00E-04	1.50E+00	2.73E-03	1.28E-08
Benzo(a)pyrene	0.180	0.13	3.39E-07	3.53E-09		7.30E+00		2.58E-08
					Exposure Route Hazard Index:		2.7E-03	
						Exposure Route Cancer Risk:		3.86E-08

wirod parNrk / CWDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel N
Construction Worker/Inhalation of Total Soil
Intake (mg/kg-day)= (Cs x IR x EF x ED/BW x AT x (VF/PEF))

IR (m3/day)	20
EF (days/year)	180
ED (years)	0.75
BW - adult (kg)	70
AT noncarc (days)	266
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	VF/PEF m3/kg	Intake Noncarc	Intake Carc	RfDI (mg/kg-d)	SfI (kg-d/mg)	Hazard Quotient Inhalation	Carc Risk Inhalation
Arsenic	1.88	1.42E+09	1.92E-10	2.00E-12		1.51E+01		3.02E-11
Benzo(a)pyrene	0.180	1.42E+09	1.84E-11	1.91E-13				

Exposure Route Hazard Index: 0.0E+00

Exposure Route Cancer Risk: 3.02E-11

wrod parNrk / CWIH

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel N
Gardener (age-adjusted)/Ingestion of Soils - 0-2'
Intake (mg/kg-day)= (Cs x IFSadj x EF x CF x FI)/(AT)

IFS adj (mg-yr/kg)	245
EF (days/year)	40
CF (kg/mg)	0.000001
FI (unitless)	1
AT carc (days)	25550

Analyte	Conc. Soil (mg/kg)	Intake Carc	SFo (kg-d/mg)	Carc Risk Oral
Arsenic	1.88	7.21E-07	1.50E+00	1.08E-06
Benzo(a)pyrene	0.180	6.90E-08	7.30E+00	5.04E-07
			Exposure Route Cancer Risk:	1.59E-06

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel N
Child Gardener/Ingestion of Soils - 0-2'
Intake (mg/kg-day)= (Cs x IR x EF x ED x CF x FI/BW x AT)

IR (mg/day)	200
EF (days/year)	40
ED (years)	6
CF (kg/mg)	0.000001
FI (unitless)	1
BW - child (kg)	15
AT noncarc (days)	2190
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	Intake Noncarc	RfDo (mg/kg-d)	Hazard Quotient Oral
Arsenic	1.88	2.75E-06	3.00E-04	9.16E-03
Benzo(a)pyrene	0.180	2.63E-07		

Exposure Route Hazard Index: 0.01

wired parNrk / CGNING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel N
Garderner (age-adjusted)/Dermal Exposure to Soils - 0-2'
Intake (mg/kg-day)= (Cs x SFSadj x ABS x AF x EF x CF) /(AT)

SFS adj - (cm2-yr/kg)	2720
AF (mg/cm^2)	1
EF (days/year)	40
CF (kg/mg)	0.000001
AT carc (days)	25,550

Analyte	**Conc. Soil (mg/kg)**	**ABS**	**Intake Carc**	**SFd kg-d/mg**	**Carc Risk Derm**
Arsenic	1.88	0.03	2.40E-07	1.50E+00	3.60E-07
Benzo(a)pyrene	0.180	0.13	9.96E-08	7.30E+00	7.27E-07
				Exposure Route Cancer Risk:	**1.09E-06**

wired parNrk / AGCDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel N
Child Gardener/Dermal Exposure to Soils - 0-2'
Intake (mg/kg-day) = (CS x CF x SA x AF x ABS x EF x ED)/(BW x AT)

SA RME - (cm2)	1825
AF (mg/cm^2)	1
EF (days/year)	40
ED (years)	6
CF (kg/mg)	0.000001
BW - child (kg)	15
AT noncarc (days)	2190

Analyte	Conc. Soil (mg/kg)	ABS	Intake Noncarc	RfDd mg/kg-d	Hazard Quotient Derm
Arsenic	1.88	0.03	7.52E-07	3.00E-04	2.51E-03
Benzo(a)pyrene	0.180	0.13	3.12E-07		
				Exposure Route Hazard Index:	2.5E-03

wired parNrk / CGNDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel N
Resident (age-adjusted)/Ingestion of Suface Soil
Intake (mg/kg-day)= (Cs x IFSadj x EF x CF x FI)/(AT)

IFS adj (mg-yr/kg)	114
EF (days/year)	350
CF (kg/mg)	0.000001
FI (unitless)	1
AT carc (days)	25550

Analyte	**Conc. Soil (mg/kg)**	**Intake Carc**	**SFo (kg-d/mg)**	**Carc Risk Oral**
Arsenic	1.88	2.94E-06	1.50E+00	4.40E-06
Benzo(a)pyrene	0.180	2.81E-07	7.30E+00	2.05E-06
			Exposure Route Cancer Risk:	**6.46E-06**

wired parNrk / ARCING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel N
Child Resident/Ingestion of Surface Soil
Intake (mg/kg-day)= (Cs x IR x EF x ED x CF x FI/BW x AT)

IR (mg/day)	200
EF (days/year)	350
ED (years)	6
CF (kg/mg)	0.000001
FI (unitless)	1
BW - child (kg)	15
AT noncarc (days)	2190

Analyte	Conc. Soil (mg/kg)	Intake Noncarc	RfDo (mg/kg-d)	Hazard Quotient Oral
Arsenic	1.88	2.40E-05	3.00E-04	8.01E-02
Benzo(a)pyrene	0.180	2.30E-06		
			Exposure Route Hazard Index:	0.08

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel N
Resident (age-adjusted)/Dermal Exposure to Surface Soil
Intake (mg/kg-day)= (Cs x SFSadj x ABS x AF x EF x CF) /(AT)

SFS adj - (cm2-yr/kg)	2720
AF (mg/cm^2)	1
EF (days/year)	350
CF (kg/mg)	0.000001
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	ABS	Intake Carc	SFd kg-d/mg	Carc Risk Derm
Arsenic	1.88	0.03	2.10E-06	1.50E+00	3.15E-06
Benzo(a)pyrene	0.180	0.13	8.72E-07	7.30E+00	6.36E-06
				Exposure Route Cancer Risk:	**9.52E-06**

wired parNrk / ARCDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel N
Child Resident/Dermal Exposure to Surface Soil
Intake (mg/kg-day) = (CS x CF x SA x AF x ABS x EF x ED)/(BW x AT)

SA RME - (cm2)	1825
AF (mg/cm2)	1
EF (days/year)	350
ED (years)	6
CF (kg/mg)	0.000001
BW - child (kg)	15
AT noncarc (days)	2190

Analyte	Conc. Soil (mg/kg)	ABS	Intake Noncarc	RfDd mg/kg-d	Hazard Quotient Derm
Arsenic	1.88	0.03	6.58E-06	3.00E-04	2.19E-02
Benzo(a)pyrene	0.180	0.13	2.73E-06		
				Exposure Route Hazard Index:	**0.02**

wired parNrk / CRNDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel P
Construction Worker/Ingestion of Total Soil
Intake (mg/kg-day)= (Cs x IR x EF x ED x CF x FI/BW x AT)

IR (mg/day)	480
EF (days/year)	180
ED (years)	0.75
CF (kg/mg)	0.000001
FI (unitless)	1
BW - adult (kg)	70
AT noncarc (days)	266
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	Intake Noncarc	Intake Carc	RfDo (mg/kg-d)	SFo (kg-d/mg)	Hazard Quotient Oral	Carc Risk Oral
Aluminum	5670	1.97E-02	2.05E-04	1.00E+00		1.97E-02	
Antimony	4.6	1.6E-05	1.67E-07	4.00E-04		4.00E-02	
Arsenic	1.5	5.22E-06	5.43E-08	3.00E-04	1.50E+00	1.74E-02	8.15E-08
Copper	38.1	1.33E-04	1.38E-06	4.00E-02		3.31E-03	
Manganese	319	1.11E-03	1.16E-05	4.70E-02		2.36E-02	
Mercury	0.07	2.44E-07	2.54E-09	3.00E-04		8.12E-04	
Nickel	8.1	2.82E-05	2.93E-07	2.00E-02		1.41E-03	
Benzo(a)anthracene	0.180	6.26E-07	6.52E-09		7.30E-01		4.76E-09
Benzo(b)fluoranthene	0.180	6.26E-07	6.52E-09		7.30E-01		4.76E-09
Benzo(k)fluoranthene	0.180	6.26E-07	6.52E-09		7.30E-02		4.76E-10
Benzo(a)pyrene	0.180	6.26E-07	6.52E-09		7.30E+00		4.76E-08
Indeno(1,2,3-cd)pyrene	0.180	6.26E-07	6.52E-09		7.30E-01		4.76E-09
Dibenz(a,h)anthracene	0.180	6.26E-07	6.52E-09		7.30E+00		4.76E-08

Exposure Route Hazard Index: 1.1E-01

Exposure Route Cancer Risk: 1.91E-07

wired parPrk / CWING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel P
Construction Worker/Dermal Exposure to Total Soil
Intake (mg/kg-day) = (CS x CF x SA x AF x ABS x EF x ED)/(BW x AT)

SA RME - (cm2)	2000
AF (mg/cm^2)	1
EF (events/year)	180
ED (years)	0.76
CF (kg/mg)	0.000001
BW - adult (kg)	70
AT noncarc (days)	266
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	ABS	Intake Noncarc	Intake Carc	RfDd mg/kg-d	SFd kg-d/mg	Hazard Quotient Derm	Carc Risk Derm
Aluminum	5670	0.01	8.33E-04	8.67E-06	2.70E-01		3.09E-03	
Antimony	4.6	0.01	6.76E-07	7.04E-09	6.00E-05		1.13E-02	
Arsenic	1.5	0.03	6.61E-07	6.88E-09	3.00E-04	1.50E+00	2.20E-03	1.03E-08
Copper	38.1	0.01	5.60E-06	5.83E-08	4.00E-02		1.40E-04	
Manganese	319	0.01	4.69E-05	4.88E-07	1.88E-03		2.49E-02	
Mercury	0.07	0.01	1.03E-08	1.07E-10	2.10E-05		4.90E-04	
Nickel	8.1	0.01	1.19E-06	1.24E-08	8.00E-04		1.49E-03	
Benzo(a)anthracene	0.180	0.13	3.44E-07	3.58E-09		7.30E-01		2.61E-09
Benzo(b)fluoranthene	0.180	0.13	3.44E-07	3.58E-09		7.30E-01		2.61E-09
Benzo(k)fluoranthene	0.180	0.13	3.44E-07	3.58E-09		7.30E-02		2.61E-10
Benzo(a)pyrene	0.180	0.13	3.44E-07	3.58E-09		7.30E+00		2.61E-08
Indeno(1,2,3-cd)pyrene	0.180	0.13	3.44E-07	3.58E-09		7.30E-01		2.61E-09
Dibenz(a,h)anthracene	0.180	0.13	3.44E-07	3.58E-09		7.30E+00		2.61E-08
					Exposure Route Hazard Index:		4.4E-02	
						Exposure Route Cancer Risk:		7.07E-08

wired parPrk / CWDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel P
Construction Worker/Inhalation of Total Soil
Intake (mg/kg-day)= (Cs x IR x EF x ED/BW x AT x VF)

IR (m3/day)	20
EF (days/year)	180
ED (years)	0.75
BW - adult (kg)	70
AT noncarc (days)	266
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	VF/PEF m3/kg	Intake Noncarc	Intake Carc	RfDi (mg/kg-d)	Sfi (kg-d/mg)	Hazard Quotient Inhalation	Carc Risk Inhalation
Aluminum	5670	1.42E+09	5.79E-07	6.03E-09	1.00E-03		5.79E-04	
Antimony	4.6	1.42E+09	4.70E-10	4.89E-12				
Arsenic	1.5	1.42E+09	1.53E-10	1.59E-12		1.51E+01		2.41E-11
Copper	38.1	1.42E+09	3.89E-09	4.05E-11				
Manganese	319	1.42E+09	3.26E-08	3.39E-10	1.43E-05		2.28E-03	
Mercury	0.07	1.42E+09	7.15E-12	7.44E-14	8.60E-05		8.31E-08	
Nickel	8.1	1.42E+09	8.27E-10	8.61E-12				
Benzo(a)anthracene	0.180	1.42E+09	1.84E-11	1.91E-13				
Benzo(b)fluoranthene	0.180	1.42E+09	1.84E-11	1.91E-13				
Benzo(k)fluoranthene	0.180	1.42E+09	1.84E-11	1.91E-13				
Benzo(a)pyrene	0.180	1.42E+09	1.84E-11	1.91E-13				
Indeno(1,2,3-cd)pyrene	0.180	1.42E+09	1.84E-11	1.91E-13				
Dibenz(a,h)anthracene	0.180	1.42E+09	1.84E-11	1.91E-13				

Exposure Route Hazard Index: 2.9E-03

Exposure Route Cancer Risk 2.41E-11

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel P
Gardener (age-adjusted)/Ingestion of Soils - 0-2'
Intake (mg/kg-day)= (Cs x IFSadj x EF x CF x FI)/(AT)

IFS adj (mg-yr/kg)	245
EF (days/year)	40
CF (kg/mg)	0.000001
FI (unitless)	1
AT carc (days)	25550

Analyte	Conc. Soil (mg/kg)	Intake Carc	SFo (kg-d/mg)	Carc Risk Oral
Aluminum	5670	2.17E-03		
Antimony	4.6	1.76E-06		
Arsenic	1.5	5.75E-07	1.50E+00	8.63E-07
Copper	38.1	1.46E-05		
Manganese	319	1.22E-04		
Mercury	0.07	2.68E-08		
Nickel	8.1	3.11E-06		
Benzo(a)anthracene	0.180	6.90E-08	7.30E-01	5.04E-08
Benzo(b)fluoranthene	0.180	6.90E-08	7.30E-01	5.04E-08
Benzo(k)fluoranthene	0.180	6.90E-08	7.30E-02	5.04E-09
Benzo(a)pyrene	0.180	6.90E-08	7.30E+00	5.04E-07
Indeno(1,2,3-cd)pyrene	0.180	6.90E-08	7.30E-01	5.04E-08
Dibenz(a,h)anthracene	0.180	6.90E-08	7.30E+00	5.04E-07
			Exposure Route Cancer Risk:	**2.03E-06**

wired parPrk / AGCING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel P
Child Gardener/Ingestion of Soils - 0-2'
Intake (mg/kg-day)= (Cs x IR x EF x ED x CF x FI/BW x AT)

IR (mg/day)	200
EF (days/year)	40
ED (years)	6
CF (kg/mg)	0.000001
FI (unitless)	1
BW - child (kg)	15
AT noncarc (days)	2190
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	Intake Noncarc	RfDo (mg/kg-d)	Hazard Quotient Oral
Aluminum	5670	8.28E-03	1.00E+00	8.28E-03
Antimony	4.6	6.72E-06	4.00E-04	1.68E-02
Arsenic	1.5	2.19E-06	3.00E-04	7.31E-03
Copper	38.1	5.57E-05	4.00E-02	1.39E-03
Manganese	319	4.66E-04	4.70E-02	9.92E-03
Mercury	0.07	1.02E-07	3.00E-04	3.41E-04
Nickel	8.1	1.18E-05	2.00E-02	5.92E-04
Benzo(a)anthracene	0.180	2.63E-07		
Benzo(b)fluoranthene	0.180	2.63E-07		
Benzo(k)fluoranthene	0.180	2.63E-07		
Benzo(a)pyrene	0.180	2.63E-07		
Indeno(1,2,3-cd)pyrene	0.180	2.63E-07		
Dibenz(a,h)anthracene	0.180	2.63E-07		

Exposure Route Hazard Index: 4.5E-02

wired parPrk / CGNING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel P
Garderner (age-adjusted)/Dermal Exposure to Soils - 0-2'
Intake (mg/kg-day)= (Cs x SFSadj x ABS x AF x EF x CF) /(AT)

SFS adj - (cm2-yr/kg)	2720
AF (mg/cm^2)	1
EF (days/year)	40
CF (kg/mg)	0.000001
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	ABS	Intake Carc	SFd kg-d/mg	Carc Risk Derm
Aluminum	5670	0.01	2.41E-04		
Antimony	4.6	0.01	1.96E-07		
Arsenic	1.5	0.03	1.92E-07	1.50E+00	2.87E-07
Copper	38.1	0.01	1.62E-06		
Manganese	319	0.01	1.36E-05		
Mercury	0.07	0.01	2.98E-09		
Nickel	8.1	0.01	3.45E-07		
Benzo(a)anthracene	0.180	0.13	9.96E-08	7.30E-01	7.27E-08
Benzo(b)fluoranthene	0.180	0.13	9.96E-08	7.30E-01	7.27E-08
Benzo(k)fluoranthene	0.180	0.13	9.96E-08	7.30E-02	7.27E-09
Benzo(a)pyrene	0.180	0.13	9.96E-08	7.30E+00	7.27E-07
Indeno(1,2,3-cd)pyrene	0.180	0.13	9.96E-08	7.30E-01	7.27E-08
Dibenz(a,h)anthracene	0.180	0.13	9.96E-08	7.30E+00	7.27E-07
				Exposure Route Cancer Risk:	**1.97E-06**

wired parPrk / AGCDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel P
Child Gardener/Dermal Exposure to Soils - 0-2'
Intake (mg/kg-day) = (CS x CF x SA x AF x ABS x EF x ED)/(BW x AT)

SA RME - (cm2)	1825
AF (mg/cm^2)	1
EF (days/year)	40
ED (years)	6
CF (kg/mg)	0.000001
BW - child (kg)	15
AT noncarc (days)	2190

Analyte	Conc. Soil (mg/kg)	ABS	Intake Noncarc	RfDd mg/kg-d	Hazard Quotient Derm
Aluminum	5670	0.01	7.56E-04	2.70E-01	2.80E-03
Antimony	4.6	0.01	6.13E-07	6.00E-05	1.02E-02
Arsenic	1.5	0.03	6.00E-07	3.00E-04	2.00E-03
Copper	38.1	0.01	5.08E-06	4.00E-02	1.27E-04
Manganese	319	0.01	4.25E-05	1.88E-03	2.26E-02
Mercury	0.07	0.01	9.33E-09	2.10E-05	4.44E-04
Nickel	8.1	0.01	1.08E-06	8.00E-04	1.35E-03
Benzo(a)anthracene	0.180	0.13	3.12E-07		
Benzo(b)fluoranthene	0.180	0.13	3.12E-07		
Benzo(k)fluoranthene	0.180	0.13	3.12E-07		
Benzo(a)pyrene	0.180	0.13	3.12E-07		
Indeno(1,2,3-cd)pyrene	0.180	0.13	3.12E-07		
Dibenz(a,h)anthracene	0.180	0.13	3.12E-07		
				Exposure Route Hazard Index:	**4.0E-02**

wired parPrk / CGNDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel P
Resident (age-adjusted)/Ingestion of Surface Soil
Intake (mg/kg-day)= (Cs x IFSadj x EF x CF x FI)/(AT)

IFS adj (mg-yr/kg)	114
EF (days/year)	350
CF (kg/mg)	0.000001
FI (unitless)	1
AT carc (days)	25550

Analyte	Conc. Soil (mg/kg)	Intake Carc	SFo (kg-d/mg)	Carc Risk Oral
Antimony	4.6	7.18E-06		
Arsenic	1.5	2.34E-06	1.50E+00	3.51E-06
Copper	37.2	5.81E-05		
Manganese	319	4.98E-04		
Mercury	0.07	1.09E-07		
Benzo(a)anthracene	0.180	2.81E-07	7.30E-01	2.05E-07
Benzo(b)fluoranthene	0.180	2.81E-07	7.30E-01	2.05E-07
Benzo(a)pyrene	0.180	2.81E-07	7.30E+00	2.05E-06
Indeno(1,2,3-cd)pyrene	0.180	2.81E-07	7.30E-01	2.05E-07
Dibenz(a,h)anthracene	0.180	2.81E-07	7.30E+00	2.05E-06
			Exposure Route Cancer Risk:	**8.23E-06**

wired parPrk / ARCING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel P
Child Resident/Ingestion of Surface Soil
Intake (mg/kg-day)= (Cs x IR x EF x ED x CF x FI/BW x AT)

IR (mg/day)	200
EF (days/year)	350
ED (years)	6
CF (kg/mg)	0.000001
FI (unitless)	1
BW - child (kg)	15
AT noncarc (days)	2190

Analyte	Conc. Soil (mg/kg)	Intake Noncarc	RfDo (mg/kg-d)	Hazard Quotient Oral
Antimony	4.6	5.88E-05	4.00E-04	1.47E-01
Arsenic	1.5	1.92E-05	3.00E-04	6.39E-02
Copper	37.2	4.76E-04	4.00E-02	1.19E-02
Manganese	319	4.08E-03	4.70E-02	8.68E-02
Mercury	0.07	8.95E-07	3.00E-04	2.98E-03
Benzo(a)anthracene	0.180	2.30E-06		
Benzo(b)fluoranthene	0.180	2.30E-06		
Benzo(a)pyrene	0.180	2.30E-06		
Indeno(1,2,3-cd)pyrene	0.180	2.30E-06		
Dibenz(a,h)anthracene	0.180	2.30E-06		
			Exposure Route Hazard Index:	**0.31**

wired parPrk / CRNING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel P
Resident (age-adjusted)/Dermal Exposure to Surface Soil
Intake (mg/kg-day)= (Cs x SFSadj x ABS x AF x EF x CF) /(AT)

SFS adj - (cm2-yr/kg)	2720
AF (mg/cm^2)	1
EF (days/year)	350
CF (kg/mg)	0.000001
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	ABS	Intake Carc	SFd kg-d/mg	Carc Risk Derm
Antimony	4.6	0.01	1.71E-06		
Arsenic	1.5	0.03	1.68E-06	1.50E+00	2.52E-06
Copper	37.2	0.01	1.39E-05		
Manganese	319	0.01	1.19E-04		
Mercury	0.07	0.01	2.61E-08		
Benzo(a)anthracene	0.180	0.13	8.72E-07	7.30E-01	6.36E-07
Benzo(b)fluoranthene	0.180	0.13	8.72E-07	7.30E-01	6.36E-07
Benzo(a)pyrene	0.180	0.13	8.72E-07	7.30E+00	6.36E-06
Indeno(1,2,3-cd)pyrene	0.180	0.13	8.72E-07	7.30E-01	6.36E-07
Dibenz(a,h)anthracene	0.180	0.13	8.72E-07	7.30E+00	6.36E-06
				Exposure Route Cancer Risk:	**1.72E-05**

wired parPrk / ARCDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel P
Child Resident/Dermal Exposure to Surface Soil
Intake (mg/kg-day) = (CS x CF x SA x AF x ABS x EF x ED)/(BW x AT)

SA RME - (cm2)	1825
AF(mg/cm2)	1
EF (days/year)	350
ED (years)	6
CF (kg/mg)	0.000001
BW - child (kg)	15
AT noncarc (days)	2190

Analyte	Conc. Soil (mg/kg)	ABS	Intake Noncarc	RfDd mg/kg-d	Hazard Quotient Derm
Antimony	4.6	0.01	5.37E-06	6.00E-05	8.94E-02
Arsenic	1.5	0.03	5.25E-06	3.00E-04	1.75E-02
Copper	37.2	0.01	4.34E-05	4.00E-02	1.09E-03
Manganese	319	0.01	3.72E-04	1.88E-03	1.98E-01
Mercury	0.07	0.01	8.17E-08	2.10E-05	3.89E-03
Benzo(a)anthracene	0.180	0.13	2.73E-06		
Benzo(b)fluoranthene	0.180	0.13	2.73E-06		
Benzo(a)pyrene	0.180	0.13	2.73E-06		
Indeno(1,2,3-cd)pyrene	0.180	0.13	2.73E-06		
Dibenz(a,h)anthracene	0.180	0.13	2.73E-06		
				Exposure Route Hazard Index:	**0.31**

wired parPrk / CRNDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel S
Construction Worker/Ingestion of Total Soil
Intake (mg/kg-day)= (Cs x IR x EF x ED x CF x FI/BW x AT)

IR (mg/day)	480
EF (days/year)	180
ED (years)	0.75
CF (kg/mg)	0.000001
FI (unitless)	1
BW - adult (kg)	70
AT noncarc (days)	266
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	Intake Noncarc	Intake Carc	RfDo (mg/kg-d)	SFo (kg-d/mg)	Hazard Quotient Oral	Carc Risk Oral
Aluminum	4740	1.65E-02	1.72E-04	1.00E+00		1.65E-02	
Antimony	13.1	4.56E-05	4.75E-07	4.00E-04		1.14E-01	
Arsenic	12.5	4.35E-05	4.53E-07	3.00E-04	1.50E+00	1.45E-01	6.79E-07
Copper	2110	7.34E-03	7.64E-05	4.00E-02		1.84E-01	
Manganese	539	1.88E-03	1.95E-05	4.70E-02		3.99E-02	
Mercury	0.25	8.7E-07	9.06E-09	3.00E-04		2.90E-03	
Nickel	15.4	5.36E-05	5.58E-07	2.00E-02		2.68E-03	
Benzo(a)anthracene	1.500	5.22E-06	5.43E-08		7.30E-01		3.97E-08
Benzo(b)fluoranthene	1.900	6.61E-06	6.88E-08		7.30E-01		5.03E-08
Benzo(k)fluoranthene	0.560	1.95E-06	2.03E-08		7.30E-02		1.48E-09
Benzo(a)pyrene	1.500	5.22E-06	5.43E-08		7.30E+00		3.97E-07
Indeno(1,2,3-cd)pyrene	0.540	1.88E-06	1.96E-08		7.30E-01		1.43E-08
Dibenz(a,h)anthracene	0.345	1.2E-06	1.25E-08		7.30E+00		9.12E-08
				Exposure Route Hazard Index:		0.50	
					Exposure Route Cancer Risk:		1.27E-06

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel S
Construction Worker/Dermal Exposure to Total Soil
Intake (mg/kg-day) = (CS x CF x SA x AF x ABS x EF x ED)/(BW x AT)

SA RME - (cm2)	2000
AF (mg/cm^2)	1
EF (events/year)	180
ED (years)	0.75
CF (kg/mg)	0.000001
BW - adult (kg)	70
AT noncarc (days)	266
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	ABS	Intake Noncarc	Intake Carc	RfDd mg/kg-d	SFd kg-d/mg	Hazard Quotient Derm	Carc Risk Derm
Aluminum	4740	0.01	6.87E-04	7.16E-06	2.70E-01		2.55E-03	
Antimony	13.1	0.01	1.90E-06	1.98E-08	6.00E-05		3.17E-02	
Arsenic	12.5	0.03	5.44E-06	5.66E-08	3.00E-04	1.50E+00	1.81E-02	8.49E-08
Copper	2110	0.01	3.06E-04	3.19E-06	4.00E-02		7.65E-03	
Manganese	539	0.01	7.82E-05	8.14E-07	1.88E-03		4.16E-02	
Mercury	0.25	0.01	3.63E-08	3.77E-10	2.10E-05		1.73E-03	
Nickel	15.4	0.01	2.23E-06	2.32E-08	8.00E-04		2.79E-03	
Benzo(a)anthracene	1.500	0.13	2.83E-06	2.94E-08		7.30E-01		2.15E-08
Benzo(b)fluoranthene	1.900	0.13	3.58E-06	3.73E-08		7.30E-01		2.72E-08
Benzo(k)fluoranthene	0.560	0.13	1.06E-06	1.10E-08		7.30E-02		8.02E-10
Benzo(a)pyrene	1.500	0.13	2.83E-06	2.94E-08		7.30E+00		2.15E-07
Indeno(1,2,3-cd)pyrene	0.540	0.13	1.02E-06	1.06E-08		7.30E-01		7.74E-09
Dibenz(a,h)anthracene	0.345	0.13	6.50E-07	6.77E-09		7.30E+00		4.94E-08
					Exposure Route Hazard Index:		0.11	
						Exposure Route Cancer Risk:		4.06E-07

wired parSrk / CWDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel S
Construction Worker/Inhalation of Total Soil
Intake (mg/kg-day)= (Cs x IR x EF x ED/BW x AT x VF)

IR (m3/day)	20
EF (days/year)	180
ED (years)	0.75
BW - adult (kg)	70
AT noncarc (days)	266
AT carc (days)	25,550

	Conc. Soil	VF/PEF	Intake		RfDi	Sfi	Hazard Quotient	Carc Risk
Analyte	**(mg/kg)**	**m3/kg**	**Noncarc**	**Carc**	**(mg/kg-d)**	**(kg-d/mg)**	**Inhalation**	**Inhalation**
Aluminum	4740	1.42E+09	4.84E-07	5.04E-09	1.00E-03		4.84E-04	
Antimony	13.1	1.42E+09	1.34E-09	1.39E-11				
Arsenic	12.5	1.42E+09	1.28E-09	1.33E-11		1.51E+01		2.01E-10
Copper	2110	1.42E+09	2.15E-07	2.24E-09				
Manganese	539	1.42E+09	5.50E-08	5.73E-10	1.43E-05		3.85E-03	
Mercury	0.25	1.42E+09	2.55E-11	2.66E-13	8.60E-05		2.97E-07	
Nickel	15.4	1.42E+09	1.57E-09	1.64E-11				
Benzo(a)anthracene	1.500	1.42E+09	1.53E-10	1.59E-12				
Benzo(b)fluoranthene	1.900	1.42E+09	1.94E-10	2.02E-12				
Benzo(k)fluoranthene	0.560	1.42E+09	5.72E-11	5.95E-13				
Benzo(a)pyrene	1.500	1.42E+09	1.53E-10	1.59E-12				
Indeno(1,2,3-cd)pyrene	0.540	1.42E+09	5.51E-11	5.74E-13				
Dibenz(a,h)anthracene	0.345	1.42E+09	3.52E-11	3.67E-13				

Exposure Route Hazard Index: 4.3E-03

Exposure Route Cancer Risk: 2.01E-10

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel S
Gardener (age-adjusted)/Ingestion of Soils - 0-2'
Intake (mg/kg-day)= (Cs x IFSadj x EF x CF x FI)/(AT)

IFS adj (mg-yr/kg)	245
EF (days/year)	40
CF (kg/mg)	0.000001
FI (unitless)	1
AT carc (days)	25550

Analyte	Conc. Soil (mg/kg)	Intake Carc	SFo (kg-d/mg)	Carc Risk Oral
Aluminum	4740	1.82E-03		
Antimony	13.1	5.02E-06		
Arsenic	12.5	4.79E-06	1.50E+00	7.19E-06
Copper	2110	8.09E-04		
Manganese	539	2.07E-04		
Mercury	0.25	9.59E-08		
Nickel	12	4.60E-06		
Benzo(a)anthracene	1.500	5.75E-07	7.30E-01	4.20E-07
Benzo(b)fluoranthene	1.900	7.29E-07	7.30E-01	5.32E-07
Benzo(k)fluoranthene	0.560	2.15E-07	7.30E-02	1.57E-08
Benzo(a)pyrene	1.500	5.75E-07	7.30E+00	4.20E-06
Indeno(1,2,3-cd)pyrene	0.540	2.07E-07	7.30E-01	1.51E-07
Dibenz(a,h)anthracene	0.200	7.67E-08	7.30E+00	5.60E-07
			Exposure Route Cancer Risk	**1.31E-05**

wired parSrk / AGCING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel S
Child Gardener/Ingestion of Soils - 0-2'
Intake (mg/kg-day)= (Cs x IR x EF x ED x CF x FI/BW x AT)

IR (mg/day)	200
EF (days/year)	40
ED (years)	6
CF (kg/mg)	0.000001
FI (unitless)	1
BW - child (kg)	15
AT noncarc (days)	2190

Analyte	Conc. Soil (mg/kg)	Intake Noncarc	RfDo (mg/kg-d)	Hazard Quotient Oral
Aluminum	4740	6.93E-03	1.00E+00	6.93E-03
Antimony	13.1	1.91E-05	4.00E-04	4.79E-02
Arsenic	12.5	1.83E-05	3.00E-04	6.09E-02
Copper	2110	3.08E-03	4.00E-02	7.71E-02
Manganese	539	7.88E-04	4.70E-02	1.68E-02
Mercury	0.25	3.65E-07	3.00E-04	1.22E-03
Nickel	12	1.75E-05	2.00E-02	8.77E-04
Benzo(a)anthracene	1.500	2.19E-06		
Benzo(b)fluoranthene	1.900	2.78E-06		
Benzo(k)fluoranthene	0.560	8.18E-07		
Benzo(a)pyrene	1.500	2.19E-06		
Indeno(1,2,3-cd)pyrene	0.540	7.89E-07		
Dibenz(a,h)anthracene	0.200	2.92E-07		
			Exposure Route Hazard Index:	**0.21**

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel S
Garderner (age-adjusted)/Dermal Exposure to Soils - 0-2'
Intake (mg/kg-day)= (Cs x SFSadj x ABS x AF x EF x CF) /(AT)

SFS adj - (cm2-yr/kg)	2720
AF (mg/cm^2)	1
EF (days/year)	40
CF (kg/mg)	0.000001
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	ABS	Intake Carc	SFd kg-d/mg	Carc Risk Derm
Aluminum	4740	0.01	2.02E-04		
Antimony	13.1	0.01	5.58E-07		
Arsenic	12.5	0.03	1.60E-06	1.50E+00	2.40E-06
Copper	2110	0.01	8.99E-05		
Manganese	539	0.01	2.30E-05		
Mercury	0.25	0.01	1.06E-08		
Nickel	12	0.01	5.11E-07		
Benzo(a)anthracene	1.500	0.13	8.30E-07	7.30E-01	6.06E-07
Benzo(b)fluoranthene	1.900	0.13	1.05E-06	7.30E-01	7.68E-07
Benzo(k)fluoranthene	0.560	0.13	3.10E-07	7.30E-02	2.26E-08
Benzo(a)pyrene	1.500	0.13	8.30E-07	7.30E+00	6.06E-06
Indeno(1,2,3-cd)pyrene	0.540	0.13	2.99E-07	7.30E-01	2.18E-07
Dibenz(a,h)anthracene	0.200	0.13	1.11E-07	7.30E+00	8.08E-07
				Exposure Route Cancer Risk:	**1.09E-05**

wired parSrk / AGCDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel S
Child Gardener/Dermal Exposure to Soils - 0-2'
Intake (mg/kg-day) = (CS x CF x SA x AF x ABS x EF x ED)/(BW x AT)

SA RME - (cm2)	1825
AF (mg/cm^2)	1
EF (days/year)	40
ED (years)	6
CF (kg/mg)	0.000001
BW - child (kg)	15
AT noncarc (days)	2190

Analyte	Conc. Soil (mg/kg)	ABS	Intake Noncarc	RfDd mg/kg-d	Hazard Quotient Derm
Aluminum	4740	0.01	6.32E-04	2.70E-01	2.34E-03
Antimony	13.1	0.01	1.75E-06	6.00E-05	2.91E-02
Arsenic	12.5	0.03	5.00E-06	3.00E-04	1.67E-02
Copper	2110	0.01	2.81E-04	4.00E-02	7.03E-03
Manganese	539	0.01	7.19E-05	1.88E-03	3.82E-02
Mercury	0.25	0.01	3.33E-08	2.10E-05	1.59E-03
Nickel	12	0.01	1.60E-06	8.00E-04	2.00E-03
Benzo(a)anthracene	1.500	0.13	2.60E-06		
Benzo(b)fluoranthene	1.900	0.13	3.29E-06		
Benzo(k)fluoranthene	0.560	0.13	9.71E-07		
Benzo(a)pyrene	1.500	0.13	2.60E-06		
Indeno(1,2,3-cd)pyrene	0.540	0.13	9.36E-07		
Dibenz(a,h)anthracene	0.200	0.13	3.47E-07		

Exposure Route Hazard Index: 9.7E-02

wired parSrk / CGNDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel S
Resident (age-adjusted)/Ingestion of Surface Soil
Intake (mg/kg-day)= (Cs x IFSadj x EF x CF x FI)/(AT)

IFS adj (mg-yr/kg)	114
EF (days/year)	350
CF (kg/mg)	0.000001
FI (unitless)	1
AT carc (days)	25550

Analyte	Conc. Soil (mg/kg)	Intake Carc	SFo (kg-d/mg)	Carc Risk Oral
Antimony	13.1	2.05E-05		
Arsenic	12.5	1.95E-05	1.50E+00	2.93E-05
Copper	2110	3.30E-03		
Manganese	539	8.42E-04		
Mercury	0.25	3.90E-07		
Benzo(a)anthracene	0.280	4.37E-07	7.30E-01	3.19E-07
Benzo(b)fluoranthene	0.560	8.75E-07	7.30E-01	6.38E-07
Benzo(a)pyrene	0.430	6.72E-07	7.30E+00	4.90E-06
Indeno(1,2,3-cd)pyrene	0.540	8.43E-07	7.30E-01	6.16E-07
Dibenz(a,h)anthracene	0.200	3.12E-07	7.30E+00	2.28E-06
			Exposure Route Cancer Risk	**3.80E-05**

wired parSrk / ARCING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel S
Child Resident/Ingestion of Surface Soil
Intake (mg/kg-day)= (Cs x IR x EF x ED x CF x FI/BW x AT)

IR (mg/day)	200
EF (days/year)	350
ED (years)	6
CF (kg/mg)	0.000001
FI (unitless)	1
BW - child (kg)	15
AT noncarc (days)	2190

Analyte	Conc. Soil (mg/kg)	Intake Noncarc	RfDo (mg/kg-d)	Hazard Quotient Oral
Antimony	13.1	1.67E-04	4.00E-04	4.19E-01
Arsenic	12.5	1.60E-04	3.00E-04	5.33E-01
Copper	2110	2.70E-02	4.00E-02	6.74E-01
Manganese	539	6.89E-03	4.70E-02	1.47E-01
Mercury	0.25	3.20E-06	3.00E-04	1.07E-02
Benzo(a)anthracene	0.280	3.58E-06		
Benzo(b)fluoranthene	0.560	7.16E-06		
Benzo(a)pyrene	0.430	5.50E-06		
Indeno(1,2,3-cd)pyrene	0.540	6.90E-06		
Dibenz(a,h)anthracene	0.200	2.56E-06		

Exposure Route Hazard Index: 1.78

wired parSrk / CRNING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel S
Resident (age-adjusted)/Dermal Exposure to Surface Soil
Intake (mg/kg-day)= (Cs x SFSadj x ABS x AF x EF x CF) /(AT)

SFS adj - (cm2-yr/kg)	2720
AF (mg/cm^2)	1
EF (days/year)	350
CF (kg/mg)	0.000001
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	ABS	Intake Carc	SFd kg-d/mg	Carc Risk Derm
Antimony	13.1	0.01	4.88E-06		
Arsenic	12.5	0.03	1.40E-05	1.50E+00	2.10E-05
Copper	2110	0.01	7.86E-04		
Manganese	539	0.01	2.01E-04		
Mercury	0.25	0.01	9.32E-08		
Benzo(a)anthracene	0.280	0.13	1.36E-06	7.30E-01	9.90E-07
Benzo(b)fluoranthene	0.560	0.13	2.71E-06	7.30E-01	1.98E-06
Benzo(a)pyrene	0.430	0.13	2.08E-06	7.30E+00	1.52E-05
Indeno(1,2,3-cd)pyrene	0.540	0.13	2.62E-06	7.30E-01	1.91E-06
Dibenz(a,h)anthracene	0.200	0.13	9.69E-07	7.30E+00	7.07E-06
				Exposure Route Cancer Risk:	**4.81E-05**

wired parSrk / ARCDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel S
Child Resident/Dermal Exposure to Surface Soil
Intake (mg/kg-day) = (CS x CF x SA x AF x ABS x EF x ED)/(BW x AT)

SA RME - (cm2)	1825
AF (mg/cm2)	1
EF (days/year)	350
ED (years)	6
CF (kg/mg)	0.000001
BW - child (kg)	15
AT noncarc (days)	2190

Analyte	Conc. Soil (mg/kg)	ABS	Intake Noncarc	RfDd mg/kg-d	Hazard Quotient Derm
Antimony	13.1	0.01	1.53E-05	6.00E-05	2.55E-01
Arsenic	12.5	0.03	4.38E-05	3.00E-04	1.46E-01
Copper	2110	0.01	2.46E-03	4.00E-02	6.15E-02
Manganese	539	0.01	6.29E-04	1.88E-03	3.34E-01
Mercury	0.25	0.01	2.92E-07	2.10E-05	1.39E-02
Benzo(a)anthracene	0.280	0.13	4.25E-06		
Benzo(b)fluoranthene	0.560	0.13	8.49E-06		
Benzo(a)pyrene	0.430	0.13	6.52E-06		
Indeno(1,2,3-cd)pyrene	0.540	0.13	8.19E-06		
Dibenz(a,h)anthracene	0.200	0.13	3.03E-06		

Exposure Route Hazard Index: 0.81

wired parSrk / CRNDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel T
Construction Worker/Ingestion of Total Soil
Intake (mg/kg-day)= (Cs x IR x EF x ED x CF x FI/BW x AT)

IR (mg/day)	480
EF (days/year)	180
ED (years)	0.75
CF (kg/mg)	0.000001
FI (unitless)	1
BW - adult (kg)	70
AT noncarc (days)	266
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	Intake Noncarc	Intake Carc	RfDo (mg/kg-d)	SFo (kg-d/mg)	Hazard Quotient Oral	Carc Risk Oral
Arsenic	5.1	1.77E-05	1.85E-07	3.00E-04	1.50E+00	5.92E-02	2.77E-07
Benzo(a)pyrene	0.360	1.25E-06	1.3E-08		7.30E+00		9.52E-08

Exposure Route Hazard Index: 5.9E-02

Exposure Route Cancer Risk 3.72E-07

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel T
Construction Worker/Dermal Exposure to Total Soil
Intake (mg/kg-day) = (CS x CF x SA x AF x ABS x EF x ED)/(BW x AT)

SA RME - (cm2)	2000
AF (mg/cm^2)	1
EF (events/year)	180
ED (years)	0.75
CF (kg/mg)	0.000001
BW - adult (kg)	70
AT noncarc (days)	266
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	ABS	Intake Noncarc	Intake Carc	RfDd mg/kg-d	SFd kg-d/mg	Hazard Quotient Derm	Carc Risk Derm
Arsenic	5.1	0.03	2.22E-06	2.31E-08	3.00E-04	1.50E+00	7.40E-03	3.46E-08
Benzo(a)pyrene	0.360	0.13	6.79E-07	7.07E-09		7.30E+00		5.16E-08

Exposure Route Hazard Index: 7.4E-03

Exposure Route Cancer Risk: 8.62E-08

wred parTrk / CWDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel T
Construction Worker/Inhalation of Total Soil
Intake (mg/kg-day)= (Cs x IR x EF x ED/BW x AT x (VF/PEF))

IR (m3/day)	20
EF (days/year)	180
ED (years)	0.75
BW - adult (kg)	70
AT noncarc (days)	266
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	VF/PEF m3/kg	Intake Noncarc	Intake Carc	RfDi (mg/kg-d)	Sfi (kg-d/mg)	Hazard Quotient Inhalation	Carc Risk Inhalation
Arsenic	5.1	1.42E+09	5.21E-10	5.42E-12		1.51E+01		8.19E-11
Benzo(a)pyrene	0.360	1.42E+09	3.68E-11	3.83E-13				

Exposure Route Hazard Index: 0.0E+00
Exposure Route Cancer Risk: 8.19E-11

wired parTrk / CWIH

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel T
Gardener (age-adjusted)/Ingestion of Soils - 0-2'
Intake (mg/kg-day)= (Cs x IFSadj x EF x CF x FI)/(AT)

IFS adj (mg-yr/kg)	245
EF (days/year)	40
CF (kg/mg)	0.000001
FI (unitless)	1
AT carc (days)	25550

Analyte	Conc. Soil (mg/kg)	Intake Carc	SFo (kg-d/mg)	Carc Risk Oral
Arsenic	5.1	1.96E-06	1.50E+00	2.93E-06
Benzo(a)pyrene	0.330	1.27E-07	7.30E+00	9.24E-07
			Exposure Route Cancer Risk:	**3.86E-06**

wired parTrk / AGCING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel T
Child Gardener/Ingestion of Soils - 0-2'
Intake (mg/kg-day)= (Cs x IR x EF x ED x CF x FI/BW x AT)

IR (mg/day)	200
EF (days/year)	40
ED (years)	6
CF (kg/mg)	0.000001
FI (unitless)	1
BW - child (kg)	15
AT noncarc (days)	2190
AT carc (days)	25,550

Analyte	**Conc. Soil (mg/kg)**	**Intake Noncarc**	**RfDo (mg/kg-d)**	**Hazard Quotient Oral**
Arsenic	5.1	7.45E-06	3.00E-04	2.48E-02
Benzo(a)pyrene	0.330	4.82E-07		

Exposure Route Hazard Index:	**0.02**

wired parTrk / CGNING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel T
Garderner (age-adjusted)/Dermal Exposure to Soils - 0-2'
Intake (mg/kg-day)= (Cs x SFSadj x ABS x AF x EF x CF) /(AT)

SFS adj - (cm2-yr/kg)	2720
AF (mg/cm^2)	1
EF (days/year)	40
CF (kg/mg)	0.000001
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	ABS	Intake Carc	SFd kg-d/mg	Carc Risk Derm
Arsenic	5.1	0.03	6.52E-07	1.50E+00	9.77E-07
Benzo(a)pyrene	0.330	0.13	1.83E-07	7.30E+00	1.33E-06
				Exposure Route Cancer Risk:	**2.31E-06**

wired parTrk / AGCDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel T
Child Gardener/Dermal Exposure to Soils - 0-2'
Intake (mg/kg-day) = (CS x CF x SA x AF x ABS x EF x ED)/(BW x AT)

SA RME - (cm2)	1825
AF (mg/cm^2)	1
EF (days/year)	40
ED (years)	6
CF (kg/mg)	0.000001
BW - child (kg)	15
AT noncarc (days)	2190

Analyte	Conc. Soil (mg/kg)	ABS	Intake Noncarc	RfDd mg/kg-d	Hazard Quotient Derm
Arsenic	5.1	0.03	2.04E-06	3.00E-04	6.80E-03
Benzo(a)pyrene	0.330	0.13	5.72E-07		

Exposure Route Hazard Index: 6.8E-03

wired parTrk / CGNDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel T
Resident (age-adjusted)/Ingestion of Suface Soil
Intake (mg/kg-day)= (Cs x IFSadj x EF x CF x FI)/(AT)

IFS adj (mg-yr/kg)	114
EF (days/year)	350
CF (kg/mg)	0.000001
FI (unitless)	1
AT carc (days)	25550

Analyte	**Conc. Soil (mg/kg)**	**Intake Carc**	**SFo (kg-d/mg)**	**Carc Risk Oral**
Arsenic	5.1	7.96E-06	1.50E+00	1.19E-05
Benzo(a)pyrene	0.330	5.15E-07	7.30E+00	3.76E-06
			Exposure Route Cancer Risk:	**1.57E-05**

wired-parTrk / ARCING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel T
Child Resident/Ingestion of Surface Soil
Intake (mg/kg-day)= (Cs x IR x EF x ED x CF x FI/BW x AT)

IR (mg/day)	200
EF (days/year)	350
ED (years)	6
CF (kg/mg)	0.000001
FI (unitless)	1
BW - child (kg)	15
AT noncarc (days)	2190

Analyte	Conc. Soil (mg/kg)	Intake Noncarc	RfDo (mg/kg-d)	Hazard Quotient Oral
Arsenic	5.1	6.52E-05	3.00E-04	2.17E-01
Benzo(a)pyrene	0.330	4.22E-06		
			Exposure Route Hazard Index:	0.22

wired parTrk / CRNING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel T
Resident (age-adjusted)/Dermal Exposure to Surface Soil
Intake (mg/kg-day)= (Cs x SFSadj x ABS x AF x EF x CF) /(AT)

SFS adj - (cm2-yr/kg)	2720
AF (mg/cm^2)	1
EF (days/year)	350
CF (kg/mg)	0.000001
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	ABS	Intake Carc	SFd kg-d/mg	Carc Risk Derm
Arsenic	5.1	0.03	5.70E-06	1.50E+00	8.55E-06
Benzo(a)pyrene	0.330	0.13	1.60E-06	7.30E+00	1.17E-05
				Exposure Route Cancer Risk:	**2.02E-05**

wired parTrk / ARCDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel T
Child Resident/Dermal Exposure to Surface Soil
Intake (mg/kg-day) = (CS x CF x SA x AF x ABS x EF x ED)/(BW x AT)

SA RME - (cm2)	1825
AF (mg/cm2)	1
EF (days/year)	350
ED (years)	6
CF (kg/mg)	0.000001
BW - child (kg)	15
AT noncarc (days)	2190

Analyte	Conc. Soil (mg/kg)	ABS	Intake Noncarc	RfDd mg/kg-d	Hazard Quotient Derm
Arsenic	5.1	0.03	1.79E-05	3.00E-04	5.95E-02
Benzo(a)pyrene	0.330	0.13	5.01E-06		
				Exposure Route Hazard Index:	0.06

wired parTrk / CRNDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel Q
Construction Worker/Ingestion of Total Soil
Intake (mg/kg-day)= (Cs x IR x EF x ED x CF x FI/BW x AT)

IR (mg/day)	480
EF (days/year)	180
ED (years)	0.75
CF (kg/mg)	0.000001
FI (unitless)	1
BW - adult (kg)	70
AT noncarc (days)	266
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	Intake Noncarc	Intake Carc	RfDo (mg/kg-d)	SFo (kg-d/mg)	Hazard Quotient Oral	Carc Risk Oral
Arsenic	9.8	3.41E-05	3.55E-07	3.00E-04	1.50E+00	1.14E-01	5.33E-07
Benzo(a)pyrene	0.730	2.54E-06	2.64E-08		7.30E+00		1.93E-07

Exposure Route Hazard Index: 1.1E-01

Exposure Route Cancer Risk 7.26E-07

wired parQrk / CWING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel Q
Construction Worker/Dermal Exposure to Total Soil
Intake (mg/kg-day) = (CS x CF x SA x AF x ABS x EF x ED)/(BW x AT)

SA RME - (cm2)	2000
AF (mg/cm^2)	1
EF (events/year)	180
ED (years)	0.75
CF (kg/mg)	0.000001
BW - adult (kg)	70
AT noncarc (days)	266
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	ABS	Intake Noncarc	Intake Carc	RfDd mg/kg-d	SFd kg-d/mg	Hazard Quotient Derm	Carc Risk Derm
Arsenic	9.8	0.03	4.26E-06	4.44E-08	3.00E-04	1.50E+00	1.42E-02	6.66E-08
Benzo(a)pyrene	*0.730*	*0.13*	*1.38E-06*	1.43E-08		7.30E+00		1.05E-07

Exposure Route Hazard Index: 1.4E-02

Exposure Route Cancer Risk: 1.71E-07

wred parQrk / CWDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel Q
Construction Worker/Inhalation of Total Soil
Intake (mg/kg-day)= (Cs x IR x EF x ED/BW x AT x (VF/PEF))

IR (m3/day)	20
EF (days/year)	180
ED (years)	0.75
BW - adult (kg)	70
AT noncarc (days)	266
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	VF/PEF m3/kg	Intake Noncarc	Intake Carc	RfDi (mg/kg-d)	Sfi (kg-d/mg)	Hazard Quotient Inhalation	Carc Risk Inhalation
Arsenic	9.8	1.42E+09	1.00E-09	1.04E-11		1.51E+01		1.57E-10
Benzo(a)pyrene	0.730	1.42E+09	7.45E-11	7.76E-13				

Exposure Route Hazard Index: 0.0E+00

Exposure Route Cancer Risk: 1.57E-10

wirod parOrk / CWIH

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel Q
Gardener (age-adjusted)/Ingestion of Soils - 0-2'
Intake (mg/kg-day)= (Cs x IFSadj x EF x CF x FI)/(AT)

IFS adj (mg-yr/kg)	245
EF (days/year)	40
CF (kg/mg)	0.000001
FI (unitless)	1
AT carc (days)	25550

Analyte	Conc. Soil (mg/kg)	Intake Carc	SFo (kg-d/mg)	Carc Risk Oral
Arsenic	9.8	3.76E-06	1.50E+00	5.64E-06
Benzo(a)pyrene	0.730	2.80E-07	7.30E+00	2.04E-06
			Exposure Route Cancer Risk:	7.68E-06

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel Q
Child Gardener/Ingestion of Soils - 0-2'
Intake (mg/kg-day)= (Cs x IR x EF x ED x CF x FI/BW x AT)

IR (mg/day)	200
EF (days/year)	40
ED (years)	6
CF (kg/mg)	0.000001
FI (unitless)	1
BW - child (kg)	15
AT noncarc (days)	2190
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	Intake Noncarc	RfDo (mg/kg-d)	Hazard Quotient Oral
Arsenic	9.8	1.43E-05	3.00E-04	4.77E-02
Benzo(a)pyrene	0.730	1.07E-06		

Exposure Route Hazard Index: 0.05

wired parQrk / CGNING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel Q
Garderner (age-adjusted)/Dermal Exposure to Soils - 0-2'
Intake (mg/kg-day)= (Cs x SFSadj x ABS x AF x EF x CF) /(AT)

SFS adj - (cm2-yr/kg)	2720
AF (mg/cm^2)	1
EF (days/year)	40
CF (kg/mg)	0.000001
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	ABS	Intake Carc	SFd kg-d/mg	Carc Risk Derm
Arsenic	9.8	0.03	1.25E-06	1.50E+00	1.88E-06
Benzo(a)pyrene	0.730	0.13	4.04E-07	7.30E+00	2.95E-06
				Exposure Route Cancer Risk:	**4.83E-06**

wired parOrk / AGCDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel Q
Child Gardener/Dermal Exposure to Soils - 0-2'
Intake (mg/kg-day) = (CS x CF x SA x AF x ABS x EF x ED)/(BW x AT)

SA RME - (cm2)	1825
AF (mg/cm^2)	1
EF (days/year)	40
ED (years)	6
CF (kg/mg)	0.000001
BW - child (kg)	15
AT noncarc (days)	2190

Analyte	Conc. Soil (mg/kg)	ABS	Intake Noncarc	RfDd mg/kg-d	Hazard Quotient Derm
Arsenic	9.8	0.03	3.92E-06	3.00E-04	1.31E-02
Benzo(a)pyrene	0.730	0.13	1.27E-06		
				Exposure Route Hazard Index:	**1.3E-02**

wired parOrk / CGNDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel Q
Resident (age-adjusted)/Ingestion of Suface Soil
Intake (mg/kg-day)= (Cs x IFSadj x EF x CF x FI)/(AT)

IFS adj (mg-yr/kg)	114
EF (days/year)	350
CF (kg/mg)	0.000001
FI (unitless)	1
AT carc (days)	25550

Analyte	Conc. Soil (mg/kg)	Intake Carc	SFo (kg-d/mg)	Carc Risk Oral
Arsenic	9.8	1.53E-05	1.50E+00	2.30E-05
Benzo(a)pyrene	0.730	1.14E-06	7.30E+00	8.32E-06
			Exposure Route Cancer Risk:	**3.13E-05**

wired parOrk / ARCING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel Q
Child Resident/Ingestion of Surface Soil
Intake (mg/kg-day)= (Cs x IR x EF x ED x CF x FI/BW x AT)

IR (mg/day)	200
EF (days/year)	350
ED (years)	6
CF (kg/mg)	0.000001
FI (unitless)	1
BW - child (kg)	15
AT noncarc (days)	2190

Analyte	Conc. Soil (mg/kg)	Intake Noncarc	RfDo (mg/kg-d)	Hazard Quotient Oral
Arsenic	9.8	1.25E-04	3.00E-04	4.18E-01
Benzo(a)pyrene	0.730	9.33E-06		
			Exposure Route Hazard Index:	**0.42**

wired parQrk / CRNING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel Q
Resident (age-adjusted)/Dermal Exposure to Surface Soil
Intake (mg/kg-day)= (Cs x SFSadj x ABS x AF x EF x CF) /(AT)

SFS adj - (cm2-yr/kg)	2720
AF (mg/cm^2)	1
EF (days/year)	350
CF (kg/mg)	0.000001
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	ABS	Intake Carc	SFd kg-d/mg	Carc Risk Derm
Arsenic	9.8	0.03	1.10E-05	1.50E+00	1.64E-05
Benzo(a)pyrene	0.730	0.13	3.54E-06	7.30E+00	2.58E-05
				Exposure Route Cancer Risk:	**4.22E-05**

wired parQrk / ARCDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel Q
Child Resident/Dermal Exposure to Surface Soil
Intake (mg/kg-day) = (CS x CF x SA x AF x ABS x EF x ED)/(BW x AT)

SA RME - (cm2)	1825
AF (mg/cm2)	1
EF (days/year)	350
ED (years)	6
CF (kg/mg)	0.000001
BW - child (kg)	15
AT noncarc (days)	2190

Analyte	Conc. Soil (mg/kg)	ABS	Intake Noncarc	RfDd mg/kg-d	Hazard Quotient Derm
Arsenic	9.8	0.03	3.43E-05	3.00E-04	1.14E-01
Benzo(a)pyrene	0.730	0.13	1.11E-05		

Exposure Route Hazard Index: 0.11

wired parQrk / CRNDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel R
Construction Worker/Ingestion of Total Soil
Intake (mg/kg-day)= (Cs x IR x EF x ED x CF x FI/BW x AT)

IR (mg/day)	480
EF (days/year)	180
ED (years)	0.75
CF (kg/mg)	0.000001
FI (unitless)	1
BW - adult (kg)	70
AT noncarc (days)	266
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	Intake Noncarc	Intake Carc	RfDo (mg/kg-d)	SFo (kg-d/mg)	Hazard Quotient Oral	Carc Risk Oral
Arsenic	4.5	1.57E-05	1.63E-07	3.00E-04	1.50E+00	5.22E-02	2.45E-07
Benzo(a)pyrene	0.450	1.57E-06	1.63E-08		7.30E+00		1.19E-07
				Exposure Route Hazard Index:		**5.2E-02**	
					Exposure Route Cancer Risk		**3.64E-07**

wired parRrk / CWING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel R
Construction Worker/Dermal Exposure to Total Soil
Intake (mg/kg-day) = (CS x CF x SA x AF x ABS x EF x ED)/(BW x AT)

SA RME - (cm2)	2000
AF (mg/cm^2)	1
EF (events/year)	180
ED (years)	0.75
CF (kg/mg)	0.000001
BW - adult (kg)	70
AT noncarc (days)	266
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	ABS	Intake Noncarc	Intake Carc	RfDd mg/kg-d	SFd kg-d/mg	Hazard Quotient Derm	Carc Risk Derm
Arsenic	4.5	0.03	1.96E-06	2.04E-08	3.00E-04	1.50E+00	6.53E-03	3.06E-08
Benzo(a)pyrene	0.450	0.13	8.48E-07	8.83E-09		7.30E+00		6.45E-08

Exposure Route Hazard Index: 6.5E-03

Exposure Route Cancer Risk: 9.50E-08

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel R
Construction Worker/Inhalation of Total Soil
Intake (mg/kg-day)= (Cs x IR x EF x ED/BW x AT x (VF/PEF))

IR (m3/day)	20
EF (days/year)	180
ED (years)	0.75
BW - adult (kg)	70
AT noncarc (days)	266
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	VF/PEF m3/kg	Intake Noncarc	Intake Carc	RfDi (mg/kg-d)	Sfi (kg-d/mg)	Hazard Quotient Inhalation	Carc Risk Inhalation
Arsenic	4.5	1.42E+09	4.60E-10	4.78E-12		1.51E+01		7.22E-11
Benzo(a)pyrene	0.450	1.42E+09	4.60E-11	4.78E-13				

Exposure Route Hazard Index: 0.0E+00

Exposure Route Cancer Risk: 7.22E-11

wiroci parRrk / CWIH

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel R
Gardener (age-adjusted)/Ingestion of Soils - 0-2'
Intake (mg/kg-day)= (Cs x IFSadj x EF x CF x FI)/(AT)

IFS adj (mg-yr/kg)	245
EF (days/year)	40
CF (kg/mg)	0.000001
FI (unitless)	1
AT carc (days)	25550

Analyte	**Conc. Soil (mg/kg)**	**Intake Carc**	**SFo (kg-d/mg)**	**Carc Risk Oral**
Arsenic	4.5	1.73E-06	1.50E+00	2.59E-06
Benzo(a)pyrene	0.450	1.73E-07	7.30E+00	1.26E-06
			Exposure Route Cancer Risk:	**3.85E-06**

wired parRrk / AGCING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel R
Child Gardener/Ingestion of Soils - 0-2'
Intake (mg/kg-day)= (Cs x IR x EF x ED x CF x FI/BW x AT)

IR (mg/day)	200
EF (days/year)	40
ED (years)	6
CF (kg/mg)	0.000001
FI (unitless)	1
BW - child (kg)	15
AT noncarc (days)	2190

Analyte	Conc. Soil (mg/kg)	Intake Noncarc	RfDo (mg/kg-d)	Hazard Quotient Oral
Arsenic	4.5	6.58E-06	3.00E-04	2.19E-02
Benzo(a)pyrene	0.450	6.58E-07		

Exposure Route Hazard Index: 0.02

wired parRrk / CGNING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel Q
Garderner (age-adjusted)/Dermal Exposure to Soils - 0-2'
Intake (mg/kg-day)= (Cs x SFSadj x ABS x AF x EF x CF) /(AT)

SFS adj - (cm2-yr/kg)	2720
AF (mg/cm^2)	1
EF (days/year)	40
CF (kg/mg)	0.000001
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	ABS	Intake Carc	SFd kg-d/mg	Carc Risk Derm
Arsenic	4.5	0.03	5.75E-07	1.50E+00	8.62E-07
Benzo(a)pyrene	0.450	0.13	2.49E-07	7.30E+00	1.82E-06
				Exposure Route Cancer Risk:	**2.68E-06**

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel R
Child Gardener/Dermal Exposure to Soils - 0-2'
Intake (mg/kg-day) = (CS x CF x SA x AF x ABS x EF x ED)/(BW x AT)

SA RME - (cm2)	1825
AF (mg/cm^2)	1
EF (days/year)	40
ED (years)	6
CF (kg/mg)	0.000001
BW - child (kg)	15
AT noncarc (days)	2190

Analyte	Conc. Soil (mg/kg)	ABS	Intake Noncarc	RfDd mg/kg-d	Hazard Quotient Derm
Arsenic	4.5	0.03	1.80E-06	3.00E-04	6.00E-03
Benzo(a)pyrene	0.450	0.13	7.80E-07		
				Exposure Route Hazard Index:	**6.0E-03**

wired parRrk / CGNDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel R
Resident (age-adjusted)/Ingestion of Suface Soil
Intake (mg/kg-day)= (Cs x IFSadj x EF x CF x FI)/(AT)

IFS adj (mg-yr/kg)	114
EF (days/year)	350
CF (kg/mg)	0.000001
FI (unitless)	1
AT carc (days)	25550

Analyte	Conc. Soil (mg/kg)	Intake Carc	SFo (kg-d/mg)	Carc Risk Oral
Arsenic	4.5	7.03E-06	1.50E+00	1.05E-05
Benzo(a)pyrene	0.450	7.03E-07	7.30E+00	5.13E-06
			Exposure Route Cancer Risk:	**1.57E-05**

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel R
Child Resident/Ingestion of Surface Soil
Intake (mg/kg-day)= (Cs x IR x EF x ED x CF x FI/BW x AT)

IR (mg/day)	200
EF (days/year)	350
ED (years)	6
CF (kg/mg)	0.000001
FI (unitless)	1
BW - child (kg)	15
AT noncarc (days)	2190

Analyte	Conc. Soil (mg/kg)	Intake Noncarc	RfDo (mg/kg-d)	Hazard Quotient Oral
Arsenic	*4.5*	*5.75E-05*	*3.00E-04*	*1.92E-01*
Benzo(a)pyrene	0.450	5.75E-06		
			Exposure Route Hazard Index:	**0.19**

wired parRrk / CRNING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel R
Resident (age-adjusted)/Dermal Exposure to Surface Soil
Intake (mg/kg-day)= (Cs x SFSadj x ABS x AF x EF x CF) /(AT)

SFS adj - (cm2-yr/kg)	2720
AF (mg/cm^2)	1
EF (days/year)	350
CF (kg/mg)	0.000001
AT carc (days)	25,550

Analyte	**Conc. Soil (mg/kg)**	**ABS**	**Intake Carc**	**SFd kg-d/mg**	**Carc Risk Derm**
Arsenic	4.5	0.03	5.03E-06	1.50E+00	7.55E-06
Benzo(a)pyrene	0.450	0.13	2.18E-06	7.30E+00	1.59E-05
				Exposure Route Cancer Risk:	**2.35E-05**

wired parRrk / ARCDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel R
Child Resident/Dermal Exposure to Surface Soil
Intake (mg/kg-day) = (CS x CF x SA x AF x ABS x EF x ED)/(BW x AT)

SA RME - (cm2)	1825
AF (mg/cm2)	1
EF (days/year)	350
ED (years)	6
CF (kg/mg)	0.000001
BW - child (kg)	15
AT noncarc (days)	2190

Analyte	Conc. Soil (mg/kg)	ABS	Intake Noncarc	RfDd mg/kg-d	Hazard Quotient Derm
Arsenic	4.5	0.03	1.58E-05	3.00E-04	5.25E-02
Benzo(a)pyrene	0.450	0.13	6.83E-06		

Exposure Route Hazard Index: 0.05

wired parRrk / CRNDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel F
Construction Worker/Ingestion of Total Soil
Intake (mg/kg-day)= (Cs x IR x EF x ED x CF x FI/BW x AT)

IR (mg/day)	480
EF (days/year)	180
ED (years)	0.75
CF (kg/mg)	0.000001
FI (unitless)	1
BW - adult (kg)	70
AT noncarc (days)	266
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	Intake Noncarc	Intake Carc	RfDo (mg/kg-d)	SFo (kg-d/mg)	Hazard Quotient Oral	Carc Risk Oral
Aluminum	8860	3.08E-02	3.21E-04	1.00E+00		3.08E-02	
Antimony	6.65	2.31E-05	2.41E-07	4.00E-04		5.79E-02	
Arsenic	10.8	3.76E-05	3.91E-07	3.00E-04	1.50E+00	1.25E-01	5.87E-07
Copper	2220	7.73E-03	8.04E-05	4.00E-02		1.93E-01	
Manganese	1410	4.91E-03	5.11E-05	4.70E-02		1.04E-01	
Mercury	27.9	9.71E-05	1.01E-06	3.00E-04		3.24E-01	
Nickel	298	1.04E-03	1.08E-05	2.00E-02		5.19E-02	
Benzo(a)anthracene	9.700	3.38E-05	3.51E-07		7.30E-01		2.57E-07
Benzo(b)fluoranthene	9.700	3.38E-05	3.51E-07		7.30E-01		2.57E-07
Benzo(k)fluoranthene	10.000	3.48E-05	3.62E-07		7.30E-02		2.64E-08
Benzo(a)pyrene	11.000	3.83E-05	3.99E-07		7.30E+00		2.91E-06
Indeno(1,2,3-cd)pyrene	6.400	2.23E-05	2.32E-07		7.30E-01		1.69E-07
Dibenz(a,h)anthracene	2.000	6.96E-06	7.25E-08		7.30E+00		5.29E-07
				Exposure Route Hazard Index:		**0.89**	
					Exposure Route Cancer Risk:		**4.73E-06**

wired parFrk / CWING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel F
Construction Worker/Dermal Exposure to Total Soil
Intake (mg/kg-day) = (CS x CF x SA x AF x ABS x EF x ED)/(BW x AT)

SA RME - (cm2)	2000
AF (mg/cm^2)	1
EF (events/year)	180
ED (years)	0.75
CF (kg/mg)	0.000001
BW - adult (kg)	70
AT noncarc (days)	266
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	ABS	Intake Noncarc	Intake Carc	RfDd mg/kg-d	SFd kg-d/mg	Hazard Quotient Derm	Carc Risk Derm
Aluminum	8860	0.01	1.28E-03	1.34E-05	2.70E-01		4.76E-03	
Antimony	6.65	0.01	9.64E-07	1.00E-08	6.00E-05		1.61E-02	
Arsenic	10.8	0.03	4.70E-06	4.89E-08	3.00E-04	1.50E+00	1.57E-02	7.34E-08
Copper	2220	0.01	3.22E-04	3.35E-06	4.00E-02		8.05E-03	
Manganese	1410	0.01	2.04E-04	2.13E-06	1.88E-03		1.09E-01	
Mercury	27.9	0.01	4.05E-06	4.21E-08	2.10E-05		1.93E-01	
Nickel	298	0.01	4.32E-05	4.50E-07	8.00E-04		5.40E-02	
Benzo(a)anthracene	9.700	0.13	1.83E-05	1.90E-07		7.30E-01		1.39E-07
Benzo(b)fluoranthene	9.700	0.13	1.83E-05	1.90E-07		7.30E-01		1.39E-07
Benzo(k)fluoranthene	10.000	0.13	1.89E-05	1.96E-07		7.30E-02		1.43E-08
Benzo(a)pyrene	11.000	0.13	2.07E-05	2.16E-07		7.30E+00		1.58E-06
Indeno(1,2,3-cd)pyrene	6.400	0.13	1.21E-05	1.26E-07		7.30E-01		9.17E-08
Dibenz(a,h)anthracene	2.000	0.13	3.77E-06	3.93E-08		7.30E+00		2.87E-07
					Exposure Route Hazard Index:		0.40	
						Exposure Route Cancer Risk:		2.32E-06

wred parFrk / CWDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel F
Construction Worker/Inhalation of Total Soil
Intake (mg/kg-day)= (Cs x IR x EF x ED/BW x AT x (VF/PEF))

IR (m3/day)	20
EF (days/year)	180
ED (years)	0.75
BW - adult (kg)	70
AT noncarc (days)	266
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	VF/PEF m3/kg	Intake Noncarc	Intake Carc	RfDi (mg/kg-d)	Sfi (kg-d/mg)	Hazard Quotient Inhalation	Carc Risk Inhalation
Aluminum	8860	1.42E+09	9.05E-07	9.42E-09	1.00E-03		9.05E-04	
Antimony	6.65	1.42E+09	6.79E-10	7.07E-12				
Arsenic	10.8	1.42E+09	1.10E-09	1.15E-11		1.51E+01		1.73E-10
Copper	2220	1.42E+09	2.27E-07	2.36E-09				
Manganese	1410	1.42E+09	1.44E-07	1.50E-09	1.43E-05		1.01E-02	
Mercury	27.9	1.42E+09	2.85E-09	2.97E-11	8.60E-05		3.31E-05	
Nickel	298	1.42E+09	3.04E-08	3.17E-10				
Benzo(a)anthracene	9.700	1.42E+09	9.91E-10	1.03E-11				
Benzo(b)fluoranthene	9.700	1.42E+09	9.91E-10	1.03E-11				
Benzo(k)fluoranthene	10.000	1.42E+09	1.02E-09	1.06E-11				
Benzo(a)pyrene	11.000	1.42E+09	1.12E-09	1.17E-11				
Indeno(1,2,3-cd)pyrene	6.400	1.42E+09	6.54E-10	6.80E-12				
Dibenz(a,h)anthracene	2.000	1.42E+09	2.04E-10	2.13E-12				

Exposure Route Hazard Index: 0.01

Exposure Route Cancer Risk: 1.73E-10

wrod parFrk / CWIH

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel F
Gardener (age-adjusted)/Ingestion of Soils - 0-2'
Intake (mg/kg-day)= (Cs x IFSadj x EF x CF x FI)/(AT)

IFS adj (mg-yr/kg)	245
EF (days/year)	40
CF (kg/mg)	0.000001
FI (unitless)	1
AT carc (days)	25550

Analyte	Conc. Soil (mg/kg)	Intake Carc	SFo (kg-d/mg)	Carc Risk Oral
Aluminum	6200	2.38E-03		
Antimony	5.55	2.13E-06		
Arsenic	10.8	4.14E-06	1.50E+00	6.21E-06
Copper	664	2.55E-04		
Manganese	592	2.27E-04		
Mercury	27.9	1.07E-05		
Nickel	23.7	9.09E-06		
Benzo(a)anthracene	1.700	6.52E-07	7.30E-01	4.76E-07
Benzo(b)fluoranthene	2.800	1.07E-06	7.30E-01	7.84E-07
Benzo(k)fluoranthene	1.200	4.60E-07	7.30E-02	3.36E-08
Benzo(a)pyrene	1.700	6.52E-07	7.30E+00	4.76E-06
Indeno(1,2,3-cd)pyrene	1.200	4.60E-07	7.30E-01	3.36E-07
Dibenz(a,h)anthracene	0.450	1.73E-07	7.30E+00	1.26E-06
			Exposure Route Cancer Risk:	**1.39E-05**

wired parFrk / AGCING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel F
Child Gardener/Ingestion of Soils - 0-2'
Intake (mg/kg-day)= (Cs x IR x EF x ED x CF x FI/BW x AT)

IR (mg/day)	200
EF (days/year)	40
ED (years)	6
CF (kg/mg)	0.000001
FI (unitless)	1
BW - child (kg)	15
AT noncarc (days)	2190
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	Intake Noncarc	RfDo (mg/kg-d)	Hazard Quotient Oral
Aluminum	6200	9.06E-03	1.00E+00	9.06E-03
Antimony	5.55	8.11E-06	4.00E-04	2.03E-02
Arsenic	10.8	1.58E-05	3.00E-04	5.26E-02
Copper	664	9.70E-04	4.00E-02	2.43E-02
Manganese	592	8.65E-04	4.70E-02	1.84E-02
Mercury	27.9	4.08E-05	3.00E-04	1.36E-01
Nickel	23.7	3.46E-05	2.00E-02	1.73E-03
Benzo(a)anthracene	1.700	2.48E-06		
Benzo(b)fluoranthene	2.800	4.09E-06		
Benzo(k)fluoranthene	1.200	1.75E-06		
Benzo(a)pyrene	1.700	2.48E-06		
Indeno(1,2,3-cd)pyrene	1.200	1.75E-06		
Dibenz(a,h)anthracene	0.450	6.58E-07		
			Exposure Route Hazard Index:	**0.26**

wired parFrk / CGNING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel F
Garderner (age-adjusted)/Dermal Exposure to Soils - 0-2'
Intake (mg/kg-day)= (Cs x SFSadj x ABS x AF x EF x CF) /(AT)

SFS adj - (cm2-yr/kg)	2720
AF (mg/cm^2)	1
EF (days/year)	40
CF (kg/mg)	0.000001
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	ABS	Intake Carc	SFd kg-d/mg	Carc Risk Derm
Aluminum	6200	0.01	2.64E-04		
Antimony	5.55	0.01	2.36E-07		
Arsenic	10.8	0.03	1.38E-06	1.50E+00	2.07E-06
Copper	664	0.01	2.83E-05		
Manganese	592	0.01	2.52E-05		
Mercury	27.9	0.01	1.19E-06		
Nickel	23.7	0.01	1.01E-06		
Benzo(a)anthracene	1.700	0.13	9.41E-07	7.30E-01	6.87E-07
Benzo(b)fluoranthene	2.800	0.13	1.55E-06	7.30E-01	1.13E-06
Benzo(k)fluoranthene	1.200	0.13	6.64E-07	7.30E-02	4.85E-08
Benzo(a)pyrene	1.700	0.13	9.41E-07	7.30E+00	6.87E-06
Indeno(1,2,3-cd)pyrene	1.200	0.13	6.64E-07	7.30E-01	4.85E-07
Dibenz(a,h)anthracene	0.450	0.13	2.49E-07	7.30E+00	1.82E-06
				Exposure Route Cancer Risk	**1.31E-05**

wired parFrk / AGCDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel F
Child Gardener/Dermal Exposure to Soils - 0-2'
Intake (mg/kg-day) = (CS x CF x SA x AF x ABS x EF x ED)/(BW x AT)

SA RME - (cm2)	1825
AF (mg/cm^2)	1
EF (days/year)	40
ED (years)	6
CF (kg/mg)	0.000001
BW - child (kg)	15
AT noncarc (days)	2190

Analyte	Conc. Soil (mg/kg)	ABS	Intake Noncarc	RfDd mg/kg-d	Hazard Quotient Derm
Aluminum	6200	0.01	8.27E-04	2.70E-01	3.06E-03
Antimony	5.55	0.01	7.40E-07	6.00E-05	1.23E-02
Arsenic	10.8	0.03	4.32E-06	3.00E-04	1.44E-02
Copper	664	0.01	8.85E-05	4.00E-02	2.21E-03
Manganese	592	0.01	7.89E-05	1.88E-03	4.20E-02
Mercury	27.9	0.01	3.72E-06	2.10E-05	1.77E-01
Nickel	23.7	0.01	3.16E-06	8.00E-04	3.95E-03
Benzo(a)anthracene	1.700	0.13	2.95E-06		
Benzo(b)fluoranthene	2.800	0.13	4.85E-06		
Benzo(k)fluoranthene	1.200	0.13	2.08E-06		
Benzo(a)pyrene	1.700	0.13	2.95E-06		
Indeno(1,2,3-cd)pyrene	1.200	0.13	2.08E-06		
Dibenz(a,h)anthracene	0.450	0.13	7.80E-07		

Exposure Route Hazard Index: 0.26

wired parFrk / CGNDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel F
Resident (age-adjusted)/Ingestion of Surface Soil
Intake (mg/kg-day)= (Cs x IFSadj x EF x CF x FI)/(AT)

IFS adj (mg-yr/kg)	114
EF (days/year)	350
CF (kg/mg)	0.000001
FI (unitless)	1
AT carc (days)	25550

Analyte	Conc. Soil (mg/kg)	Intake Carc	SFo (kg-d/mg)	Carc Risk Oral
Antimony	5.55	8.67E-06		
Arsenic	6	9.37E-06	1.50E+00	1.41E-05
Copper	242	3.78E-04		
Manganese	592	9.24E-04		
Mercury	27.9	4.36E-05		
Benzo(a)anthracene	0.780	1.22E-06	7.30E-01	8.89E-07
Benzo(b)fluoranthene	1.600	2.50E-06	7.30E-01	1.82E-06
Benzo(a)pyrene	1.300	2.03E-06	7.30E+00	1.48E-05
Indeno(1,2,3-cd)pyrene	1.200	1.87E-06	7.30E-01	1.37E-06
Dibenz(a,h)anthracene	0.450	7.03E-07	7.30E+00	5.13E-06
			Exposure Route Cancer Risk:	**3.81E-05**

wired parFrk / ARCING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel F
Child Resident/Ingestion of Surface Soil
Intake (mg/kg-day)= (Cs x IR x EF x ED x CF x FI/BW x AT)

IR (mg/day)	200
EF (days/year)	350
ED (years)	6
CF (kg/mg)	0.000001
FI (unitless)	1
BW - child (kg)	15
AT noncarc (days)	2190

Analyte	Conc. Soil (mg/kg)	Intake Noncarc	RfDo (mg/kg-d)	Hazard Quotient Oral
Antimony	5.55	7.10E-05	4.00E-04	1.77E-01
Arsenic	6	7.67E-05	3.00E-04	2.56E-01
Copper	242	3.09E-03	4.00E-02	7.74E-02
Manganese	592	7.57E-03	4.70E-02	1.61E-01
Mercury	27.9	3.57E-04	3.00E-04	1.19E+00
Benzo(a)anthracene	0.780	9.97E-06		
Benzo(b)fluoranthene	1.600	2.05E-05		
Benzo(a)pyrene	1.300	1.66E-05		
Indeno(1,2,3-cd)pyrene	1.200	1.53E-05		
Dibenz(a,h)anthracene	0.450	5.75E-06		
			Exposure Route Hazard Index:	**1.86**

wired parFrk / CRNING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel F
Resident (age-adjusted)/Dermal Exposure to Surface Soil
Intake (mg/kg-day)= (Cs x SFSadj x ABS x AF x EF x CF) /(AT)

SFS adj - (cm2-yr/kg)	2720
AF (mg/cm^2)	1
EF (days/year)	350
CF (kg/mg)	0.000001
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	ABS	Intake Carc	SFd kg-d/mg	Carc Risk Derm
Antimony	5.55	0.01	2.07E-06		
Arsenic	6	0.03	6.71E-06	1.50E+00	1.01E-05
Copper	242	0.01	9.02E-05		
Manganese	592	0.01	2.21E-04		
Mercury	27.9	0.01	1.04E-05		
Benzo(a)anthracene	0.780	0.13	3.78E-06	7.30E-01	2.76E-06
Benzo(b)fluoranthene	1.600	0.13	7.75E-06	7.30E-01	5.66E-06
Benzo(a)pyrene	1.300	0.13	6.30E-06	7.30E+00	4.60E-05
Indeno(1,2,3-cd)pyrene	1.200	0.13	5.81E-06	7.30E-01	4.24E-06
Dibenz(a,h)anthracene	0.450	0.13	2.18E-06	7.30E+00	1.59E-05
				Exposure Route Cancer Risk:	**8.46E-05**

wired parFrk / ARCDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel F
Child Resident/Dermal Exposure to Surface Soil
Intake (mg/kg-day) = (CS x CF x SA x AF x ABS x EF x ED)/(BW x AT)

SA RME - (cm2)	1825
AF (mg/cm2)	1
EF (days/year)	350
ED (years)	6
CF (kg/mg)	0.000001
BW - child (kg)	15
AT noncarc (days)	2190

Analyte	Conc. Soil (mg/kg)	ABS	Intake Noncarc	RfDd mg/kg-d	Hazard Quotient Derm
Antimony	5.55	0.01	6.48E-06	6.00E-05	1.08E-01
Arsenic	6	0.03	2.10E-05	3.00E-04	7.00E-02
Copper	242	0.01	2.82E-04	4.00E-02	7.06E-03
Manganese	592	0.01	6.91E-04	1.88E-03	3.67E-01
Mercury	27.9	0.01	3.26E-05	2.10E-05	1.55E+00
Benzo(a)anthracene	0.780	0.13	1.18E-05		
Benzo(b)fluoranthene	1.600	0.13	2.43E-05		
Benzo(a)pyrene	1.300	0.13	1.97E-05		
Indeno(1,2,3-cd)pyrene	1.200	0.13	1.82E-05		
Dibenz(a,h)anthracene	0.450	0.13	6.83E-06		
				Exposure Route Hazard Index:	**2.10**

wired parFrk / CRNDER

Hlmco Dump Superfund Site
Intake and Risk Calculation

Parcel D
Construction Worker/Ingestion of Total Soil
Intake (mg/kg-day)= (Cs x IR x EF x ED x CF x FI/BW x AT)

IR (mg/day)	480
EF (days/year)	180
ED (years)	0.75
CF (kg/mg)	0.000001
FI (unitless)	1
BW - adult (kg)	70
AT noncarc (days)	266
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	Intake Noncarc	Intake Carc	RfDo (mg/kg-d)	SFo (kg-d/mg)	Hazard Quotient Oral	Carc Risk Oral
Aluminum	5210	1.81E-02	1.89E-04	1.00E+00		1.81E-02	
Antimony	6.9	2.4E-05	2.5E-07	4.00E-04		6.00E-02	
Arsenic	6.1	2.12E-05	2.21E-07	3.00E-04	1.50E+00	7.08E-02	3.32E-07
Copper	113	3.93E-04	4.09E-06	4.00E-02		9.83E-03	
Manganese	373	1.30E-03	1.35E-05	4.70E-02		2.76E-02	
Mercury	0.2	6.96E-07	7.25E-09	3.00E-04		2.32E-03	
Nickel	14.7	5.12E-05	5.33E-07	2.00E-02		2.56E-03	
Benzo(a)anthracene	1.100	3.83E-06	3.99E-08		7.30E-01		2.91E-08
Benzo(b)fluoranthene	1.700	5.92E-06	6.16E-08		7.30E-01		4.50E-08
Benzo(k)fluoranthene	2.100	7.31E-06	7.61E-08		7.30E-02		5.55E-09
Benzo(a)pyrene	1.400	4.87E-06	5.07E-08		7.30E+00		3.70E-07
Indeno(1,2,3-cd)pyrene	1.100	3.83E-06	3.99E-08		7.30E-01		2.91E-08
Dibenz(a,h)anthracene	0.360	1.25E-06	1.3E-08		7.30E+00		9.52E-08
				Exposure Route Hazard Index:		**0.19**	
					Exposure Route Cancer Risk		**9.06E-07**

wired parDrk / CWING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel D
Construction Worker/Dermal Exposure to Total Soil
Intake (mg/kg-day) = (CS x CF x SA x AF x ABS x EF x ED)/(BW x AT)

SA RME - (cm2)	2000
AF (mg/cm^2)	1
EF (events/year)	180
ED (years)	0.75
CF (kg/mg)	0.000001
BW - adult (kg)	70
AT noncarc (days)	266
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	ABS	Intake Noncarc	Intake Carc	RfDd mg/kg-d	SFd kg-d/mg	Hazard Quotient Derm	Carc Risk Derm
Aluminum	5210	0.01	7.55E-04	7.87E-06	2.70E-01		2.80E-03	
Antimony	6.9	0.01	1.00E-06	1.04E-08	6.00E-05		1.67E-02	
Arsenic	6.1	0.03	2.65E-06	2.76E-08	3.00E-04	1.50E+00	8.85E-03	4.14E-08
Copper	113	0.01	1.64E-05	1.71E-07	4.00E-02		4.10E-04	
Manganese	373	0.01	5.41E-05	5.63E-07	1.88E-03		2.88E-02	
Mercury	0.2	0.01	2.90E-08	3.02E-10	2.10E-05		1.38E-03	
Nickel	14.7	0.01	2.13E-06	2.22E-08	8.00E-04		2.66E-03	
Benzo(a)anthracene	1.100	0.13	2.07E-06	2.16E-08		7.30E-01		1.58E-08
Benzo(b)fluoranthene	1.700	0.13	3.20E-06	3.34E-08		7.30E-01		2.44E-08
Benzo(k)fluoranthene	2.100	0.13	3.96E-06	4.12E-08		7.30E-02		3.01E-09
Benzo(a)pyrene	1.400	0.13	2.64E-06	2.75E-08		7.30E+00		2.01E-07
Indeno(1,2,3-cd)pyrene	1.100	0.13	2.07E-06	2.16E-08		7.30E-01		1.58E-08
Dibenz(a,h)anthracene	0.360	0.13	6.79E-07	7.07E-09		7.30E+00		5.16E-08
					Exposure Route Hazard Index:		0.06	
						Exposure Route Cancer Risk:		3.52E-07

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel D
Construction Worker/Inhalation of Total Soil
Intake (mg/kg-day)= (Cs x IR x EF x ED/BW x AT x VF)

IR (m3/day)	20
EF (days/year)	180
ED (years)	0.75
BW - adult (kg)	70
AT noncarc (days)	266
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	VF/PEF m3/kg	Intake Noncarc	Intake Carc	RfDi (mg/kg-d)	SfI (kg-d/mg)	Hazard Quotient Inhalation	Carc Risk Inhalation
Aluminum	5210	1.42E+09	5.32E-07	5.54E-09	1.00E-03		5.32E-04	
Antimony	6.9	1.42E+09	7.05E-10	7.34E-12				
Arsenic	6.1	1.42E+09	6.23E-10	6.49E-12		1.51E+01		9.79E-11
Copper	113	1.42E+09	1.15E-08	1.20E-10				
Manganese	373	1.42E+09	3.81E-08	3.97E-10	1.43E-05		2.66E-03	
Mercury	0.2	1.42E+09	2.04E-11	2.13E-13	8.60E-05		2.37E-07	
Nickel	14.7	1.42E+09	1.50E-09	1.56E-11				
Benzo(a)anthracene	1.100	1.42E+09	1.12E-10	1.17E-12				
Benzo(b)fluoranthene	1.700	1.42E+09	1.74E-10	1.81E-12				
Benzo(k)fluoranthene	2.100	1.42E+09	2.14E-10	2.23E-12				
Benzo(a)pyrene	1.400	1.42E+09	1.43E-10	1.49E-12				
Indeno(1,2,3-cd)pyrene	1.100	1.42E+09	1.12E-10	1.17E-12				
Dibenz(a,h)anthracene	0.360	1.42E+09	3.68E-11	3.83E-13				

Exposure Route Hazard Index: 3.2E-03

Exposure Route Cancer Risk: 9.79E-11

wired parDrk / CWIH

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel D
Gardener (age-adjusted)/Ingestion of Soils - 0-2'
Intake (mg/kg-day)= (Cs x IFSadj x EF x CF x FI)/(AT)

IFS adj (mg-yr/kg-d)	245
EF (days/year)	40
CF (kg/mg)	0.000001
FI (unitless)	1
AT carc (days)	25550

Analyte	Conc. Soil (mg/kg)	Intake Carc	SFo (kg-d/mg)	Carc Risk Oral
Aluminum	4120	1.58E-03		
Antimony	5.7	2.19E-06		
Arsenic	6.1	2.34E-06	1.50E+00	3.51E-06
Copper	113	4.33E-05		
Manganese	373	1.43E-04		
Mercury	0.2	7.67E-08		
Nickel	14.7	5.64E-06		
Benzo(a)anthracene	1.100	4.22E-07	7.30E-01	3.08E-07
Benzo(b)fluoranthene	1.700	6.52E-07	7.30E-01	4.76E-07
Benzo(k)fluoranthene	2.100	8.05E-07	7.30E-02	5.88E-08
Benzo(a)pyrene	1.400	5.37E-07	7.30E+00	3.92E-06
Indeno(1,2,3-cd)pyrene	1.100	4.22E-07	7.30E-01	3.08E-07
Dibenz(a,h)anthracene	0.360	1.38E-07	7.30E+00	1.01E-06
			Exposure Route Cancer Risk:	**9.59E-06**

wired parDrk / AGCING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel D
Child Gardener/Ingestion of Soils - 0-2'
Intake (mg/kg-day)= (Cs x IR x EF x ED x CF x FI/BW x AT)

IR (mg/day)	200
EF (days/year)	40
ED (years)	6
CF (kg/mg)	0.000001
FI (unitless)	1
BW - child (kg)	15
AT noncarc (days)	2190

Analyte	Conc. Soil (mg/kg)	Intake Noncarc	RfDo (mg/kg-d)	Hazard Quotient Oral
Aluminum	4120	6.02E-03	1.00E+00	6.02E-03
Antimony	5.7	8.33E-06	4.00E-04	2.08E-02
Arsenic	6.1	8.91E-06	3.00E-04	2.97E-02
Copper	113	1.65E-04	4.70E-02	3.51E-03
Manganese	373	5.45E-04	2.00E-02	2.73E-02
Mercury	0.2	2.92E-07	3.00E-04	9.74E-04
Nickel	14.7	2.15E-05	2.00E-02	1.07E-03
Benzo(a)anthracene	1.100	1.61E-06		
Benzo(b)fluoranthene	1.700	2.48E-06		
Benzo(k)fluoranthene	2.100	3.07E-06		
Benzo(a)pyrene	1.400	2.05E-06		
Indeno(1,2,3-cd)pyrene	1.100	1.61E-06		
Dibenz(a,h)anthracene	0.360	5.26E-07		

Exposure Route Hazard Index: 0.09

wired parDrk / CGNING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel D
Garderner (age-adjusted)/Dermal Exposure to Soils - 0-2'
Intake (mg/kg-day)= (Cs x SFSadj x ABS x AF x EF x CF) /(AT)

SFS adj - (cm2-yr/kg)	2720
AF (mg/cm^2)	1
EF (days/year)	40
CF (kg/mg)	0.000001
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	ABS	Intake Carc	SFd kg-d/mg	Carc Risk Derm
Aluminum	4120	0.01	1.75E-04		
Antimony	5.7	0.01	2.43E-07		
Arsenic	6.1	0.03	7.79E-07	1.50E+00	1.17E-06
Copper	113	0.01	4.81E-06		
Manganese	373	0.01	1.59E-05		
Mercury	0.2	0.01	8.52E-09		
Nickel	14.7	0.01	6.26E-07		
Benzo(a)anthracene	1.100	0.13	6.09E-07	7.30E-01	4.45E-07
Benzo(b)fluoranthene	1.700	0.13	9.41E-07	7.30E-01	6.87E-07
Benzo(k)fluoranthene	2.100	0.13	1.16E-06	7.30E-02	8.49E-08
Benzo(a)pyrene	1.400	0.13	7.75E-07	7.30E+00	5.66E-06
Indeno(1,2,3-cd)pyrene	1.100	0.13	6.09E-07	7.30E-01	4.45E-07
Dibenz(a,h)anthracene	0.360	0.13	1.99E-07	7.30E+00	1.45E-06
			Exposure Route Cancer Risk:		**9.94E-06**

wired parDrk / AGCDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel D
Child Gardener/Dermal Exposure to Soils - 0-2'
Intake (mg/kg-day) = (CS x CF x SA x AF x ABS x EF x ED)/(BW x AT)

SA RME - (cm2)	1825
AF (mg/cm^2)	1
EF (days/year)	40
ED (years)	6
CF (kg/mg)	0.000001
BW - child (kg)	15
AT noncarc (days)	2190

Analyte	Conc. Soil (mg/kg)	ABS	Intake Noncarc	RfDd mg/kg-d	Hazard Quotient Derm
Aluminum	4120	0.01	5.49E-04	2.70E-01	2.03E-03
Antimony	5.7	0.01	7.60E-07	6.00E-05	1.27E-02
Arsenic	6.1	0.03	2.44E-06	3.00E-04	8.13E-03
Copper	113	0.01	1.51E-05	4.00E-02	3.77E-04
Manganese	373	0.01	4.97E-05	1.88E-03	2.65E-02
Mercury	0.2	0.01	2.67E-08	2.10E-05	1.27E-03
Nickel	14.7	0.01	1.96E-06	8.00E-04	2.45E-03
Benzo(a)anthracene	1.100	0.13	1.91E-06		
Benzo(b)fluoranthene	1.700	0.13	2.95E-06		
Benzo(k)fluoranthene	2.100	0.13	3.64E-06		
Benzo(a)pyrene	1.400	0.13	2.43E-06		
Indeno(1,2,3-cd)pyrene	1.100	0.13	1.91E-06		
Dibenz(a,h)anthracene	0.360	0.13	6.24E-07		
				Exposure Route Hazard Index:	**0.05**

wired parDrk / CGNDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel D
Resident (age-adjusted)/Ingestion of Surface Soil
Intake (mg/kg-day)= (Cs x IFSadj x EF x CF x FI)/(AT)

IFS adj (mg-yr/kg-d)	114
EF (days/year)	350
CF (kg/mg)	0.000001
FI (unitless)	1
AT carc (days)	25550

Analyte	Conc. Soil (mg/kg)	Intake Carc	SFo (kg-d/mg)	Carc Risk Oral
Antimony	5.6	8.75E-06		
Arsenic	3.4	5.31E-06	1.50E+00	7.96E-06
Copper	50.6	7.90E-05		
Manganese	373	5.82E-04		
Mercury	0.06	9.37E-08		
Benzo(a)anthracene	0.310	4.84E-07	7.30E-01	3.53E-07
Benzo(b)fluoranthene	0.380	5.93E-07	7.30E-01	4.33E-07
Benzo(a)pyrene	0.430	6.72E-07	7.30E+00	4.90E-06
Indeno(1,2,3-cd)pyrene	0.370	5.78E-07	7.30E-01	4.22E-07
Dibenz(a,h)anthracene	0.130	2.03E-07	7.30E+00	1.48E-06
			Exposure Route Cancer Risk:	**1.56E-05**

wired parDrk / ARCING

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel D
Child Resident/Ingestion of Surface Soil
Intake (mg/kg-day)= (Cs x IR x EF x ED x CF x FI/BW x AT)

IR (mg/day)	200
EF (days/year)	350
ED (years)	6
CF (kg/mg)	0.000001
FI (unitless)	1
BW - child (kg)	15
AT noncarc (days)	2190

Analyte	Conc. Soil (mg/kg)	Intake Noncarc	RfDo (mg/kg-d)	Hazard Quotient Oral
Antimony	5.6	7.16E-05	4.00E-04	1.79E-01
Arsenic	3.4	4.35E-05	3.00E-04	1.45E-01
Copper	50.6	6.47E-04	4.00E-02	1.62E-02
Manganese	373	4.77E-03	4.70E-02	1.01E-01
Mercury	0.06	7.67E-07	3.00E-04	2.56E-03
Benzo(a)anthracene	0.310	3.96E-06		
Benzo(b)fluoranthene	0.380	4.86E-06		
Benzo(a)pyrene	0.430	5.50E-06		
Indeno(1,2,3-cd)pyrene	0.370	4.73E-06		
Dibenz(a,h)anthracene	0.130	1.66E-06		

Exposure Route Hazard Index: 0.44

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel D
Resident (age-adjusted)/Dermal Exposure to Surface Soil
Intake (mg/kg-day)= (Cs x SFSadj x ABS x AF x EF x CF) /(AT)

SFS adj - (cm2-yr/kg)	2720
AF (mg/cm^2)	1
EF (days/year)	350
CF (kg/mg)	0.000001
AT carc (days)	25,550

Analyte	Conc. Soil (mg/kg)	ABS	Intake Carc	SFd kg-d/mg	Carc Risk Derm
Antimony	5.6	0.01	2.09E-06		
Arsenic	3.4	0.03	3.80E-06	1.50E+00	5.70E-06
Copper	50.6	0.01	1.89E-05		
Manganese	373	0.01	1.39E-04		
Mercury	0.06	0.01	2.24E-08		
Benzo(a)anthracene	0.310	0.13	1.50E-06	7.30E-01	1.10E-06
Benzo(b)fluoranthene	0.380	0.13	1.84E-06	7.30E-01	1.34E-06
Benzo(a)pyrene	0.430	0.13	2.08E-06	7.30E+00	1.52E-05
Indeno(1,2,3-cd)pyrene	0.370	0.13	1.79E-06	7.30E-01	1.31E-06
Dibenz(a,h)anthracene	0.130	0.13	6.30E-07	7.30E+00	4.60E-06
				Exposure Route Cancer Risk:	**2.93E-05**

wired parDrk / ARCDER

Himco Dump Superfund Site
Intake and Risk Calculation

Parcel D
Child Resident/Dermal Exposure to Surface Soil
Intake (mg/kg-day) = (CS x CF x SA x AF x ABS x EF x ED)/(BW x AT)

SA RME - (cm2)	1825
AF (mg/cm2)	1
EF (days/year)	350
ED (years)	6
CF (kg/mg)	0.000001
BW - child (kg)	15
AT noncarc (days)	2190

Analyte	Conc. Soil (mg/kg)	ABS	Intake Noncarc	RfDd mg/kg-d	Hazard Quotient Derm
Antimony	5.6	0.01	6.53E-06	6.00E-05	1.09E-01
Arsenic	3.4	0.03	1.19E-05	3.00E-04	3.97E-02
Copper	50.6	0.01	5.90E-05	4.00E-02	1.48E-03
Manganese	373	0.01	4.35E-04	1.88E-03	2.31E-01
Mercury	0.06	0.01	7.00E-08	2.10E-05	3.33E-03
Benzo(a)anthracene	0.310	0.13	4.70E-06		
Benzo(b)fluoranthene	0.380	0.13	5.76E-06		
Benzo(a)pyrene	0.430	0.13	6.52E-06		
Indeno(1,2,3-cd)pyrene	0.370	0.13	5.61E-06		
Dibenz(a,h)anthracene	0.130	0.13	1.97E-06		

Exposure Route Hazard Index: 0.38

wired parDrk / CRNDER

Himco Dump Superfund Site
Intake and Risk Calculation

Well Pair WT116A/WT119A Hypothetical Exposure Location
Child Resident/Ingestion of Ground Water
Intake (mg/kg-day)= Cw x IR x EF x ED x CF/(BW x AT)

IR (L/day)	1
EF (days/year)	350
ED (years)	6
CF (mg/ug)	0.001
BW - child (kg)	15
AT noncarc (days)	2190

Analyte	Maximum Cw (ug/L)	Intake Noncarc	RfDo (mg/kg-d)	Hazard Quotient Oral
Antimony	20.4	1.30E-03	4.00E-04	3.26E+00
Arsenic	6	3.84E-04	3.00E-04	1.28E+00
Iron	32400	2.07E+00	3.00E-01	6.90E+00
Manganese	1810	1.16E-01	2.00E-02	5.79E+00
Thallium	5.5	3.52E-04	8.00E-05	4.39E+00
Bis(2-ethylhexyl)phthalate	7.0	4.47E-04	2.00E-02	2.24E-02
Carbazole	6.0	3.84E-04		
Benzene	15.0	9.59E-04	3.00E-03	3.20E-01
1,2-Dichloropropane	4.0	2.56E-04		
Vinyl Chloride	1.0	6.39E-05	3.00E-03	2.13E-02
			Exposure Route Hazard Index:	**18.73**

wiredgw16-19 / CRNING

Himco Dump Superfund Site
Intake and Risk Calculation

Well Pair WT116A/WT119A Hypothetical Exposure Location
Resident (age-adjusted)/Ingestion of Ground Water
Intake (mg/kg-day)= (Cw x IFWadj x EF x CF)/(AT)

IFW adj (L-yr/kg-d)	1.09
EF (days/year)	350
CF (mg/ug)	0.001
AT carc (days)	25550

Analyte	Maximum Cw (ug/L)	Intake Carc	SFo (kg-d/mg)	Carc Risk Oral
Antimony	20.4	3.05E-04		
Arsenic	6	8.96E-05	1.50E+00	1.34E-04
Iron	32400	4.84E-01		
Manganese	1810	2.70E-02		
Thallium	5.5	8.21E-05		
Bis(2-ethylhexyl)phthalate	7.0	1.05E-04	1.40E-02	1.46E-06
Carbazole	6.0	8.96E-05	2.00E-02	1.79E-06
Benzene	15.0	2.24E-04	5.50E-02	1.23E-05
1,2-Dichloropropane	4.0	5.97E-05	6.80E-02	4.06E-06
Vinyl Chloride	1.0	1.49E-05	1.40E+00	2.09E-05
			Exposure Route Cancer Risk:	**1.75E-04**

wiredgw16-19 / ARCING

Himco Dump Superfund Site
Intake and Risk Calculation

Well Pair WT116A/WT119A Hypothetical Exposure Location
Resident (carc age-adjusted)/Inhalation of VOCs from Ground Water (shower/bath)
Noncarc Intake (mg/kg-day) = (Ca x IR x ET x EF x ED x CF)/(BW x AT)
Carc Intake (mg/kg-day)= (Ca x InhFadj x EF x CF)/(AT)

IR (m3/hour)	0.6
InhFadj (m3-yr/kg-hr)	0.22
ETchild (hours/day)	0.75
EF (days/year)	350
ED child (years)	6
CF (mg/ug)	0.001
BW - child (kg)	15
AT noncarc (days)	2,190
AT carc (days)	25,550

Inhalation of VOCs from ground water while showering (Andelman, 1990)
Ca-s = (Cw x fs x Fw-s x t x1/V)/2

	Child Intake	Resident Intake
fs (unitless)	0.75	0.75
Fw-s (L/hr)	600	600
t (hr)	0.75	0.31
V (m3)	9	9

Analyte	Maximum Cw (ug/L)	Conc. Air (ug/m3) Child	Conc. Air (ug/m3) Resident	Intake Child	Intake Resident	RfDi (mg/kg-d)	SfI (kg-d/mg)	Hazard Quotient Oral	Carc Risk Oral
Benzene	15.0	281	116	8.09E-03	3.50E-04	1.70E-03	2.70E-02	4.76E+00	9.46E-06
1,2-Dichloropropane	4.0	75	31	2.16E-03	9.34E-05	1.14E-03		1.89E+00	
Vinyl Chloride	1.0	18.75	8	5.39E-04	2.34E-05	2.86E-02	3.10E-02	1.89E-02	7.24E-07
						Exposure Route Hazard Index:		6.67	
							Exposure Route Cancer Risk:		1.02E-05

Himco Dump Superfund Site
Intake and Risk Calculation

Well Pair WT116A/WT119A Hypothetical Exposure Location
Resident (carc age-adjusted)/Inhalation of VOCs from Ground Water (air in house)
Noncarc Intake (mg/kg-day) = (Ca x IR x EF x ED x CF)/(BW x AT)
Carc Intake (mg/kg-day)= (Ca x InhFadj x EF x CF)/(AT)

IR (m3/day)	20
InhFadj (m3-yr/kg-day)	18.3
EF (days/year)	350
ED (years)	6
CF (mg/ug)	0.001
BW - child (kg)	15
AT noncarc (days)	2,190
AT carc (days)	25,550

Inhalation of VOCs from ground water - air in house (Andelman, 1990)
Ca-s = (Cw x Fw-h x fh)/(HV x k x ER)

Fw-h (L/day)	723
fh (unitless)	0.5
HV (m3)	177.7
k (unitless)	0.15
ER (exchanges/day)	13.7

Analyte	Maximum Cw (ug/L)	Conc. Air (ug/m3)	Intake Child	Intake Resident	RfDi (mg/kg-d)	Sfi (kg-d/mg)	Hazard Quotient Oral	Carc Risk Oral
Benzene	15.0	14.8	1.90E-02	3.72E-03	1.70E-03	2.70E-02	1.12E+01	1.01E-04
1,2-Dichloropropane	4.0	3.96	5.06E-03	9.93E-04	1.14E-03		4.44E+00	
Vinyl Chloride	1.0	1.0	1.27E-03	2.48E-04	2.86E-02	3.10E-02	4.43E-02	7.69E-06
					Exposure Route Hazard Index:		15.65	
						Exposure Route Cancer Risk:		1.08E-04

Himco Dump Superfund Site
Intake and Risk Calculation

Well Pair WT116A/WT119A Hypothetical Exposure Location
Resident child/adult (carc)Dermal Exposure to Ground Water
Carc Intake (mg/kg-day) Inorganics = (Cw x SFWadj x Kp x EF x CF1 x CF2)/(AT)
Carc Intake (mg/kg-day) Organics = ((Cw x SA x (2 x Kp x sqrt(6 x tau x t/pi)) x EF x ED x CF1 x CF2)/(BW)
+ (Cw x SA x (2 x Kp x sqrt(6 x tau x t/pi)) x EF x ED x CF1 x CF2)/(BW))/AT
Carc Intake (mg/kg-day) Benzene, Vinyl Chloride = ((Cw x SA x (Kp x (t/(1+*B*) + 2 x tau x ((1 + 3 x *B*)/(1+*B*))) x EF x ED x CF1 x CF2/BW)
+ (Cw x SA x (Kp x (t/(1+B) + 2 x tau x ((1 + 3 x B)/(1+B))) x EF x ED x CF1 x CF2/BW))/AT

SA child (cm2-yr/kg)	7,300
SA adult (cm2-yr/kg)	20,000
SFWadj inorganic (cm2-yr/kg)	3,561
EF (events/year)	350
CF1 (L/cm3)	0.001
CF2 (mg/ug)	0.001
AT carc (days)	25,550
ED child (years)	6
ED adult (years)	24
BW-adult (kg)	70
BW-child (kg)	15

Analyte	Maximum Cw (ug/L)	Kp (cm/hr)	tau (hr)	tadult (hr)	tchild (hr)	*B*	Intake Carc	SFd kg-d/mg	Carc Risk Derm
Antimony	20.4	0.001					9.95E-07		
Arsenic	6	0.001					2.93E-07	1.50E+00	4.39E-07
Iron	32400	0.001					1.58E-03		
Manganese	1810	0.001					8.83E-05		
Thallium	5.5	0.001					2.68E-07		
Bis(2-ethylhexyl)phthalate	7.0	3.30E-02	2.10E+01	2.00E-01	7.50E-01		2.24E-04	1.40E-02	3.14E-06
Carbazole	6.0	6.55E-02	9.20E-01	2.00E-01	7.50E-01		7.99E-05	2.00E-02	1.60E-06
Benzene	15.0	2.00E-02	2.60E-01	2.00E-01	7.50E-01	1.30E-02	3.59E-05	5.50E-02	1.97E-06
1,2-Dichloropropane	4.0	1.00E-02	4.30E-01	2.00E-01	7.50E-01		5.56E-06	6.80E-02	3.78E-07
Vinyl Chloride	1.0	7.30E-03	2.10E-01	2.00E-01	7.50E-01	2.30E-03	7.68E-07	1.40E+00	1.07E-06
								Exposure Route Cancer Risk:	8.60E-06

wiredgw16-19 / ARCDER

Himco Dump Superfund Site
Intake and Risk Calculation

Well Pair WT116A/WT119A Hypothetical Exposure Location
Child Resident/Dermal Exposure to Ground Water
Noncarc Intake (mg/kg-day) Inorganics = (Cw x SA x Kp x ET x EF x ED x CF1 x CF2)/(BW x AT)
Noncarc Intake (mg/kg-day) Organics = (Cw x SA x (2 x Kp x sqrt(6 x tau x t/pi)) x EF x ED x CF1 x CF2)/(BW x AT)
Noncarc Intake (mg/kg-day) Benzene/Vinyl Chloride = (Cw x SA x (Kp x (t/(1+*B*) + 2 x tau x ((1 + 3 x *B*)/(1+*B*))) x EF x ED x CF1 x CF2)/BW x AT)

SA -child (cm2)	7,300
tevent/ET (hours/event)	0.75
EF (events/year)	350
ED (years)	6
CF1 (L/cm3)	0.001
CF2 (mg/ug)	0.001
BW child - (kg)	15
AT noncarc (days)	2,190

Analyte	Maximum Cw (ug/L)	Kp (cm/hr)	tau (hr)	*B*	Intake Noncarc	RfDd mg/kg-d	Hazard Q Derm
Antimony	20.4	0.001			7.14E-06	6.00E-05	1.19E-01
Arsenic	6	0.001			2.10E-06	3.00E-04	7.00E-03
Iron	32400	0.001			1.13E-02	1.50E-02	7.56E-01
Manganese	1810	0.001			6.34E-04	1.88E-03	3.37E-01
Thallium	5.5	0.001			1.93E-06	8.00E-05	2.41E-02
Bis(2-ethylhexyl)phthalate	7.0	3.30E-02	2.10E+01		1.18E-03	2.00E-02	5.91E-02
Carbazole	6.0	6.55E-02	9.20E-01		4.21E-04		
Benzene	15.0	2.00E-02	2.60E-01	1.30E-02	1.78E-04	3.00E-03	5.94E-02
1,2-Dichloropropane	4.0	1.00E-02	4.30E-01		2.93E-05		
Vinyl Chloride	1.0	7.30E-03	2.10E-01	2.30E-03	3.99E-06	1.40E+00	2.85E-06
					Exposure Route Hazard Index:		1.36

wiredgw16-19 / CRNDER

Himco Dump Superfund Site
Intake and Risk Calculation

Eastern Hypothetical Exposure Location
Resident (age-adjusted)/Ingestion of Ground Water
Intake (mg/kg-day)= (Cw x IFWadj x EF x CF)/(AT)

IFW adj (L-yr/kg-d)	1.09
EF (days/year)	350
CF (mg/ug)	0.001
AT carc (days)	25550

Analyte	Cw (ug/L)*	Intake Carc	SFo (kg-d/mg)	Carc Risk Oral
Arsenic	24.3	3.63E-04	1.50E+00	5.44E-04
Iron	28,100	4.20E-01		
Manganese	3,080	4.60E-02		
Thallium	6.7	1.00E-04		
Bis(2-ethylhexyl)phthalate	8	1.19E-04	1.40E-02	1.67E-06
Benzene	3	4.48E-05	5.50E-02	2.46E-06
1,2-Dichloropropane	2	2.99E-05	6.80E-02	2.03E-06
			Exposure Route Cancer Risk:	**5.50E-04**

wiredgw01-14 / ARCING

Himco Dump Superfund Site
Intake and Risk Calculation

Eastern Hypothetical Exposure Location
Child Resident/Ingestion of Ground Water
Intake (mg/kg-day)= Cw x IR x EF x ED x CF/(BW x AT)

IR (L/day)	1
EF (days/year)	350
ED (years)	6
CF (mg/ug)	0.001
BW - child (kg)	15
AT noncarc (days)	2190

Analyte	Cw (ug/L)*	Intake Noncarc	RfDo (mg/kg-d)	Hazard Quotient Oral
Arsenic	24.3	1.55E-03	3.00E-04	5.18E+00
Iron	28,100	1.80E+00	3.00E-01	5.99E+00
Chromium	13.1	8.37E-04	3.00E-03	2.79E-01
Manganese	3,080	1.97E-01	4.70E-02	4.19E+00
Thallium	6.7	4.28E-04	8.00E-05	5.35E+00
Bis(2-ethylhexyl)phthalate	8	5.11E-04	2.00E-02	2.56E-02
Benzene	3	1.92E-04	3.00E-03	6.39E-02
1,2-Dichloropropane	2	1.28E-04		
			Exposure Route Hazard Index:	**21.08**

wiredgw01-14 / CRNING

Himco Dump Superfund Site
Intake and Risk Calculation

Eastern Hypothetical Exposure Location
Resident (carc age-adjusted)/Inhalation of VOCs from Ground Water (shower/bath)
Noncarc Intake (mg/kg-day) = (Ca x IR x ET x EF x ED x CF)/(BW x AT)
Carc Intake (mg/kg-day)= (Ca x InhFadj x EF x CF)/(AT)

IR (m3/hour)	0.6
InhFadj (m3-yr/kg-hr)	0.22
ETchild (hours/day)	0.75
EF (days/year)	350
EDchild (years)	6
CF (mg/ug)	0.001
BW - child (kg)	15
AT noncarc (days)	2,190
AT carc (days)	25,550

Inhalation of VOCs from ground water while showering (Andelman, 1990)
Ca-s = (Cw x fs x Fw-s x t x1/V)/2

	Noncarc Intake	Carc Intake
fs (unitless)	0.75	0.75
Fw-s (L/hr)	600	600
t (hr)	0.75	0.31
V (m3)	9	9

Analyte	Cw (ug/L)*	Conc. Air (ug/m3) Noncarc	Conc. Air (ug/m3) Carc	Intake Noncarc	Intake Carc	RfDi (mg/kg-d)	SfI (kg-d/mg)	Hazard Quotient Oral	Carc Risk Oral
Benzene	3	56.3	23.3	1.62E-03	7.01E-05	1.70E-03	2.70E-02	9.52E-01	1.89E-06
1,2-Dichloropropane	2.0	37.5	15.5	1.08E-03	4.67E-05	1.14E-03		9.46E-01	

Exposure Route Hazard Index: 1.90

Exposure Route Cancer Risk: 1.89E-06

*Cw equivalent to maximum detected concentration

wnedgw01-14 / ARNHS

Himco Dump Superfund Site
Intake and Risk Calculation

Eastern Hypothetical Exposure Location
Resident (carc age-adjusted)/Inhalation of VOCs from Ground Water (air in house)
Noncarc Intake (mg/kg-day) = (Ca x IR x EF x ED x CF)/(BW x AT)
Carc Intake (mg/kg-day)= (Ca x InhFadj x EF x CF)/(AT)

IR (m3/day)	20
InhFadj (m3-yr/kg-day)	18.3
EF (days/year)	350
ED (years)	6
CF (mg/ug)	0.001
BW - child (kg)	15
AT noncarc (days)	2,190
AT carc (days)	25,550

Inhalation of VOCs from ground water - air in house (Andelman, 1990)
Ca-s = (Cw x Fw-h x fh)/(HV x k x ER)

Fw-h (L/day)	723
fh (unitless)	0.5
HV (m3)	177.7
k (unitless)	0.15
ER (exchanges/day)	13.7

Analyte	Cw (ug/L)*	Conc. Air (ug/m3)	Intake Noncarc	Intake Carc	RfDi (mg/kg-d)	SfI (kg-d/mg)	Hazard Quotient Oral	Carc Risk Oral
Benzene	3	2.97	3.80E-03	7.44E-04	1.70E-03	2.70E-02	2.23E+00	2.01E-05
1,2-Dichloropropane	2.0	1.98	2.53E-03	4.96E-04	1.14E-03		2.22E+00	

Exposure Route Hazard Index: 4.45
Exposure Route Cancer Risk: 2.01E-05

*Cw equivalent to maximum detected concentration

Himco Dump Superfund Site
Intake and Risk Calculation

Eastern Hypothetical Exposure Location
Resident Child/Adult (carc) Dermal Exposure to Ground Water
Carc Intake (mg/kg-day) Inorganics = (Cw x SFWadj x Kp x EF x CF1 x CF2)/(AT)
Carc Intake (mg/kg-day) Organics = ((Cw x SA x (2 x Kp x sqrt(6 x tau x t/pi)) x EF x ED x CF1 x CF2)/(BW)
+ (Cw x SA x (2 x Kp x sqrt(6 x tau x t/pi)) x EF x ED x CF1 x CF2)/(BW))/AT
Carc Intake (mg/kg-day) Benzene = ((Cw x SA x (Kp x (t/(1+*B*) + 2 x tau x ((1 + 3 x *B*)/(1+*B*))) x EF x ED x CF1 x CF2/BW)
+ (Cw x SA x (Kp x (t/(1+B) + 2 x tau x ((1 + 3 x B)/(1+B))) x EF x ED x CF1 x CF2/BW))/AT

SA adult(cm2-yr/kg)	20,000
SA child (cm2-yr/kg)	7,300
SFWadj inorganic(cm2-yr/kg)	3,561
EF (events/year)	350
CF1 (L/cm3)	0.001
CF2 (mg/ug)	0.001
AT carc (days)	25,550
ED adult (years)	24
BW - adult (kg)	70
ED - child (years)	6
BW - child (kg)	15

Analyte	Cw (ug/L)*	Kp (cm/hr)	tau (hr)	tadult (hr)	tchild (hr)	*B*	Intake Carc	SFd kg-d/mg	Carc Risk Derm
Arsenic	24.3	0.001					1.19E-06	1.50E+00	1.78E-06
Iron	28,100	0.001					1.37E-03		
Manganese	3,080	0.001					1.50E-04		
Thallium	6.7	0.001					3.27E-07		
Bis(2-ethylhexyl)phthalate	8.0	3.30E-02	2.10E+01	2.00E-01	7.50E-01		2.56E-04	1.40E-02	3.59E-06
Benzene	3.0	2.00E-02	2.60E-01	2.00E-01	7.50E-01	1.30E-02	7.18E-06	5.50E-02	3.95E-07
1,2-Dichloropropane	2.0	1.00E-02	4.30E-01	2.00E-01	7.50E-01		2.78E-06	6.80E-02	1.89E-07

Exposure Route Cancer Risk: 5.95E-06

Himco Dump Superfund Site
Intake and Risk Calculation

Eastern Hypothetical Exposure Location
Child Resident/Dermal Exposure to Ground Water
Noncarc Intake (mg/kg-day) Inorganics = (Cw x SA x Kp x ET x EF x ED x CF1 x CF2)/(BW x AT)
Noncarc Intake (mg/kg-day) Organics = (Cw x SA x (2 x Kp x sqrt(6 x tau x t/pi)) x EF x ED x CF1 x CF2)/(BW x AT)
Noncarc Intake (mg/kg-day) Benzene = (Cw x SA x (Kp x (t/(1+*B*) + 2 x tau x ((1 + 3 x *B*)/(1+*B*))) x EF x ED x CF1 x CF2)/BW x AT)

SA -child (cm2)	7,300
tevent/ET(hours/event)	0.75
EF (days/year)	350
ED (years)	6
CF1 (L/cm3)	0.001
CF2 (mg/ug)	0.001
BW child - (kg)	15
AT noncarc (days)	2,190

Analyte	Cw (ug/L)*	Kp (cm/hr)	tau (hr)	*B*	Intake Noncarc	RfDd mg-kg-d	Hazard Q Derm
Arsenic	24.3	0.001			8.51E-06	3.00E-04	2.84E-02
Iron	28,100	0.001			9.84E-03	1.50E-02	6.56E-01
Chromium	13.1	0.001			4.59E-06	3.00E-05	1.53E-01
Manganese	3,080	0.001			1.08E-03	1.88E-03	5.73E-01
Thallium	6.7	0.001			2.35E-06	8.00E-05	2.93E-02
Bis(2-ethylhexyl)phthalate	8.0	3.30E-02	2.10E+01		1.35E-03	2.00E-02	6.76E-02
Benzene	3.0	2.00E-02	2.60E-01	1.30E-02	3.57E-05	3.00E-03	1.19E-02
1,2-Dichloropropane	2.0	1.00E-02	4.30E-01		5.35E-07		

Exposure Route Hazard Index: 1.52E+00

wiredgw01-14 / CRNDER

Appendix L

Geostatistical Analysis, Shallow Soil Samples Construction Debris Area, Land Parcels N, R, T, and Q

23 November 2001 CENWO-HX-G

MEMORANDUM FOR CENWO-ED-GG (Grabowski)

SUBJECT: Kriging Results for Arsenic and Benzo(a)pyrene Parcels Q, R, and T, Himco Superfund Site

1. I have researched the results of the geostatistical analysis previously performed for the Himco Superfund site, as originally reported in 1999. At that time, the objective was to estimate the concentrations of arsenic and benzo(a)pyrene (BaP) in shallow and deep soils on parcel N for risk assessment purposes. Recently, the levels of the same constituents in all or parts of parcels Q, R, and T are of interest. The results of the earlier analysis included projected concentrations for arsenic and BaP at locations within these parcels. The results are provided in the table below

Location (Parcel, coordinates*)	As Shallow ppm (Kriging Variance)**	As Deep ppm (Kriging Variance)**	BaP Shallow ppm (Kriging Variance)**	BaP Deep ppm (Kriging Variance)**
Parcel Q, 600, 480	6.7 (0.69)	4.9 (0.76)	0.73 (0.159)	0.41 (0.56)
600, 560	9.8 (0.79)	5.5 (0.88)	0.42 (0.172)	0.68 (0.70)
Parcel R, 600, 400	4.5 (1.3)	3.7 (1.5)	0.45 (0.26)	0.38 (1.1)
Parcel T, 480, 400	3.9 (0.97)	1.9 (1.1)	0.20 (0.20)	0.33 (0.82)
520, 400	4.8 (1.1)	2.3 (1.2)	0.26 (0.22)	0.36 (0.91)
560, 400	5.1 (1.3)	2.9 (1.4)	0.33 (0.25)	0.36 (1.1)

*Coordinates are relative to state-plane coordinate 406,000 easting, 1,531,500 northing and are in feet
**Kriging variance are measures of the confidence in the projected values; the higher the number, the more uncertainty associated with the estimate.

2. The results indicate that the uncertainties in the estimated shallow arsenic concentrations are low relative to the interpolated values. The same can be said for the deep arsenic and shallow BaP concentrations in Parcels Q, and deep arsenic concentrations in Parcel R. Uncertainties are large relative to interpolated concentrations for deep arsenic in Parcel T, shallow BaP in Parcels R and T, and deep BaP in all parcels. This is largely due to the small concentration for these analytes in those parcels. In summary, the uncertainties are not unreasonable for the highest values, which are of most concern.

3. Note that the shallow arsenic values were taken from a table (file) of results from the GeoEAS software. The values for shallow arsenic in Parcel N in the table did not exactly match the values provided in the original1999 report. The results are very close, however. The values provided above are believed to be the values generated during the final 1999 analysis and should reliably represent the interpolated (kriged) concentrations.

4. If you have any questions, do not hesitate to call me at 402-697-2655, or e-mail dave.j.becker@usace.army.mil.

David J. Becker
Geologist
US Army Corps of Engineers
Hazardous, Toxic, and Radioactive
Waste Center of Expertise

Himco Dump Superfund Site
Geostatistical Analysis, Shallow Soil Samples, Construction Debris Area

1. Introduction and Objective. The US Army Corps of Engineers (USACE) Omaha District previously took shallow (0-0.5, 0.5-2, 2-4, and 4-6 foot depth) soil samples at 18 locations at the Himco Dump Superfund site, Construction Debris Area. No samples were taken in one residential lot, parcel N, however. Since samples were taken at nearby locations, Omaha District and the USACE Hazardous Toxic and Radioactive Waste Center of Expertise conducted a geostatistical analysis in order to estimate exposure point concentrations for arsenic and benzo(a)pyrene in parcel N.

2. Geostatistical Basis.

2.1. Variograms. Most people would agree that samples for whatever measurements taken near to one another are more likely to yield similar or correlated results than samples taken much farther apart. Indeed, the correlation of measurement results as a function of sample location separation or spacing is typically found to decrease with increasing sample separation. Geostatistics is a branch of statistics used to determine the correlation of parameters, such as chemical concentrations, measured at specific spatial locations. The properties of the observed correlation can be used as a quantitative basis for estimates of the parameters at locations where there are no samples. Unlike other spatial interpolation techniques, the properties of the correlation allow a statistical evaluation of the goodness of the estimate. Rather than measuring the correlation, geostatisticians typically compute the variance as a function of sample separation and variance increases with increasing sample separation. The graph of variance versus sample separation distance is called the variogram. When plotted on a variogram, variance is typically found to be non-zero (less than perfect correlation) at very small separation distances. The estimated variance at the near zero separation is called the "nugget." The variance typically increases to some limit at some finite sample separation. The maximum variance is called the "sill" and the sample separation distance at which the variance reaches the sill is called the range. The range represents the distance beyond which the samples are essentially non-correlated or independent. Sample spacing less than the range provides, to some degree, duplicate information about the distribution of the parameter of interest. Once the variogram is constructed using site data, a "model" variogram is fit to the data. These models are mathematical functions that have specific properties and that are fit by eye similar to fitting a line or polynomial to scattered data. These functions have a nugget value, a range, and a sill and are the basis for the interpolation. Refer to USACE, 1997 for more information.

2.2. Kriging. As long as the samples are spaced at distances less than the range, values for the parameter of interest can be estimated at unsampled locations with some less-than-perfect certainty. The process of interpolating values at other locations in geostatistics is called Kriging. Kriging is similar to other interpolation schemes, such as inverse distance, in that known sample points near the point at which the parameters is to be estimated are used to make the estimate. Each nearby point is assigned a weight based on the variance function observed in the variogram in computing an estimate. Obviously, those nearby points that are closer are weighted more, based on the variogram model, than those farther away. The fact that the weights are based on a statistical measure of scatter or variance allows us to estimate the goodness of the estimate. Based on this, the use of geostatistics was appropriate for the study objective at parcel N.

3. Procedure.

3.1 The locations (x,y coordinates) and sample results for arsenic and benzo(a)pyrene for the 18 borings were compiled. Values for the 0-0.5 foot samples were used as reported. Values for the 0.5-2, 2-4 and the 4-6 foot samples were averaged for each borehole to account for the similar exposure scenario for those depths and to account for the inconsistent sampling at these depths. These data were then analyzed using the Geo-Eas software from EPA. Data files with the sample data, and all the sample pair separations can be provided if desired.

3.2. Variograms were constructed for each depth and parameter. Given the limited number of data points, "bin" widths for the sample separation distances were typically multiples of 50-80 feet in order to achieve a variogram that was interpretable. Given the small number of borings and the sample layout, the bin of shortest sample separations was set at 0-80 feet. Typically, there were approximately 10-27 sample pairs in each bin, with the lower numbers in the shorter sample separation bins. The number of pairs normally should be over 20 (ASTM D5922-96, USACE, 1997), but larger bins would have reduced the number of points used to assess the variogram and most bins had nearly 20 pairs.

3.3. The resulting variogram points were then fit with a geostatistical model. In all cases, a Gaussian model was found to adequately fit the points on the variogram. The models and actual variograms are provided as figures 1-4. The bins used are also shown on the figures. The nuggets, ranges, and sills for the four data sets are summarized below:

Arsenic (shallow)	Nugget = 0.2 Sill = 1.9	Range = 150 feet
Arsenic (deep)	Nugget = 0.2 Sill = 2.5	Range = 150 feet
BaP (shallow)	Nugget = 0.02 Sill = 0.07	Range = 150 feet
BaP (deep)	Nugget = 0 Sill = 1.3	Range = 130 feet

3.4. The models were used in Kriging to estimate the parameters in parcel N. Given the use of the data for estimating exposure point concentrations, a process called block Kriging was used. Block Kriging is a method by which multiple points are estimated in a "block" or area and the average of these estimated values are assigned to the block. Blocks measured 40x80 feet in all cases and 4 points were estimated in each block. X and Y coordinates for each (lower left corner) block relative to State Plane Coordinates E406000 and N1531500 are provided. Kriging results are provided as maps (figures 5-8). The estimated values within the Construction Debris Area in parcel N are summarized below.

Arsenic Shallow

X(ft)	Y(ft)	Conc (ppm)	Ksd
240.0	560.0	1.64086300	1.24807300
240.0	640.0	1.87503600	.754859900
240.0	720.0	1.52030500	1.07919500
280.0	560.0	1.30817800	1.07691600
280.0	640.0	1.44265900	.964566300
320.0	480.0	1.31944800	1.18215100
320.0	560.0	1.17966600	.751098500
320.0	640.0	1.24361900	.845973700
320.0	720.0	1.55175700	1.44878500

Arsenic Deep

X(ft)	Y(ft)	Conc (ppm)	Ksd
240.0	560.0	.900830400	1.39035800
240.0	640.0	.961112700	.828190400
240.0	720.0	.674256700	1.15487200
280.0	480.0	.859193300	1.59161600
280.0	560.0	.753817600	1.20034900
280.0	640.0	.750098900	1.06746800
280.0	720.0	.762612500	1.51910300
320.0	480.0	.837811100	1.31922700
320.0	560.0	.678439800	.836339200
320.0	640.0	.624428600	.949391600
320.0	720.0	.703130500	1.63038500

BaP Shallow

X(ft)	Y(ft)	Conc (ppm)	Ksd
240.0	560.0	.178	.244
240.0	640.0	.164	.167
240.0	720.0	.125	.213
280.0	480.0	.159	.273
280.0	560.0	.178	.219
280.0	640.0	.169	.200
280.0	720.0	.147	.262
320.0	480.0	.164	.234
320.0	560.0	.180	.165
320.0	640.0	.172	.181
320.0	720.0	.159	.279

BaP Deep

X(ft)	Y(ft)	Conc (ppm)	Ksd
240.0	560.0	.175	1.051
240.0	640.0	.165	.638
240.0	720.0	.123	.872
280.0	480.0	.174	1.151
280.0	560.0	.173	.913
280.0	640.0	.168	.843
280.0	720.0	.151	1.122
320.0	480.0	.177	.979
320.0	560.0	.172	.623
320.0	640.0	.169	.695
320.0	720.0	.165	1.176

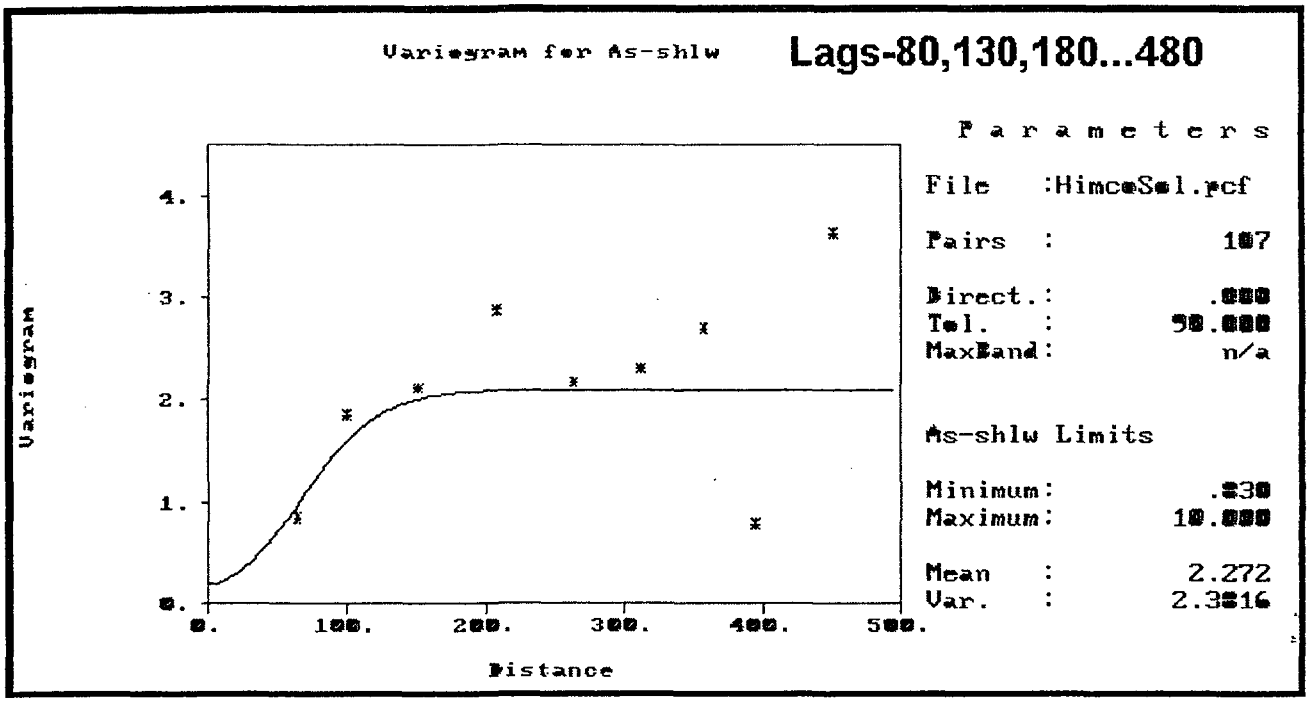
3.5. In order to assess the goodness of the estimates, the Kriging standard deviations (Ksd) for each estimate were compared. The Ksd for the points in parcel N were very consistent with the Ksd for the estimates elsewhere in the sampled area indicating that the interpolation for values in parcel N was as accurate as the interpolations anywhere within the study area. The Ksd may be larger than the value and only have meaning for one-sided (positive) evaluations of the concentrations. Note that Kriging estimates were not made for most areas on the maps since they lie outside of the sampled region. The Kriging was conducted with the requirement that at least four actual data points have be used (have non-zero weights = be within the "range" of the interpolated point) to estimate the value. This avoids extrapolation of values outside of the study area. Another measure of the adequacy of the estimates is to perform what geostatisticians call cross-validation. Cross validation involves estimating, by Kriging, the value at an actual sampled data point, but without using the value reported for that point. As long as the estimated value (estimated without the observed value in the Kriging process) is reasonably close to the observed value, then the Kriging is relatively accurate. Cross validation for points in the western half of the study area (near parcel N) showed a very good accuracy.

4.0 Conclusions. The ranges observed on the variograms clearly indicate that the sample points outside but near parcel N were close enough to provide reasonably good estimate of the concentrations in parcel N. The Kriging estimates of chemical concentrations in soils appear to have reasonable accuracy based on the Ksd and cross validation results. These results should be usable for the risk assessment of parcel N.

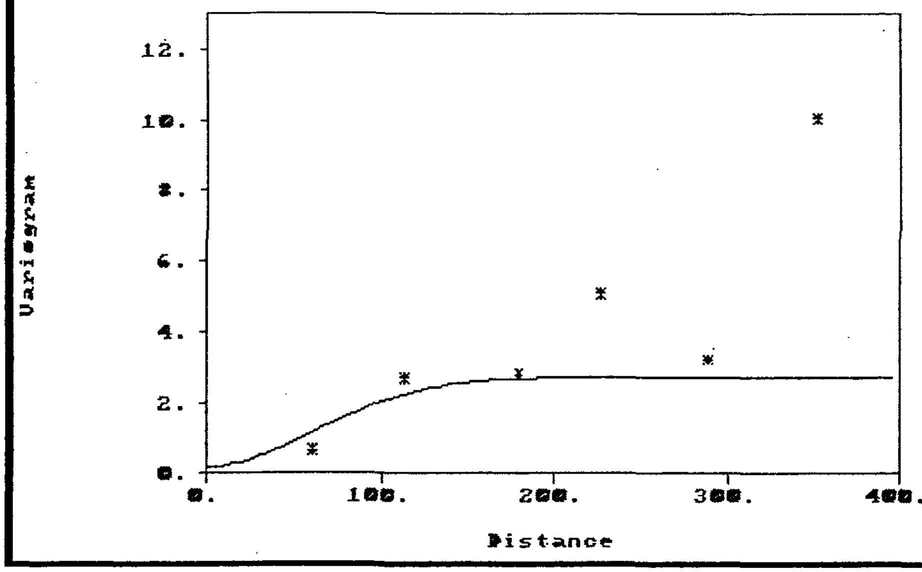
5.0 References.

5.1. US Army Corps of Engineers, Engineer Technical Letter ETL 1110-1-175, Practical Aspects of Applying Geostatistics at Hazardous, Toxic, and Radioactive Waste Sites, 30 June 1997. Available at http://www.usace.army.mil/inet/usace-docs/eng-tech-ltrs/. Prepared by the US Geological Survey for USACE.

5.2. ASTM D5522-96, "Standard guide for analysis of spatial variation in geostatistical site investigations."


Variogram for As-shlw
Lags-80,130,180...480
Parameters
File :HimcoSol.pcf
Pairs : 107
Direct.: .000
Tol. : 90.000
MaxBand: n/a
As-shlw Limits
Minimum: .030
Maximum: 10.000
Mean : 2.272
Var. : 2.3016
Variogram
0.
1.
2.
3.
4.
0.
100.
200.
300.
400.
500.
Distance

Variogram for As-deep **Lags 80,140,200...380**



Parameters

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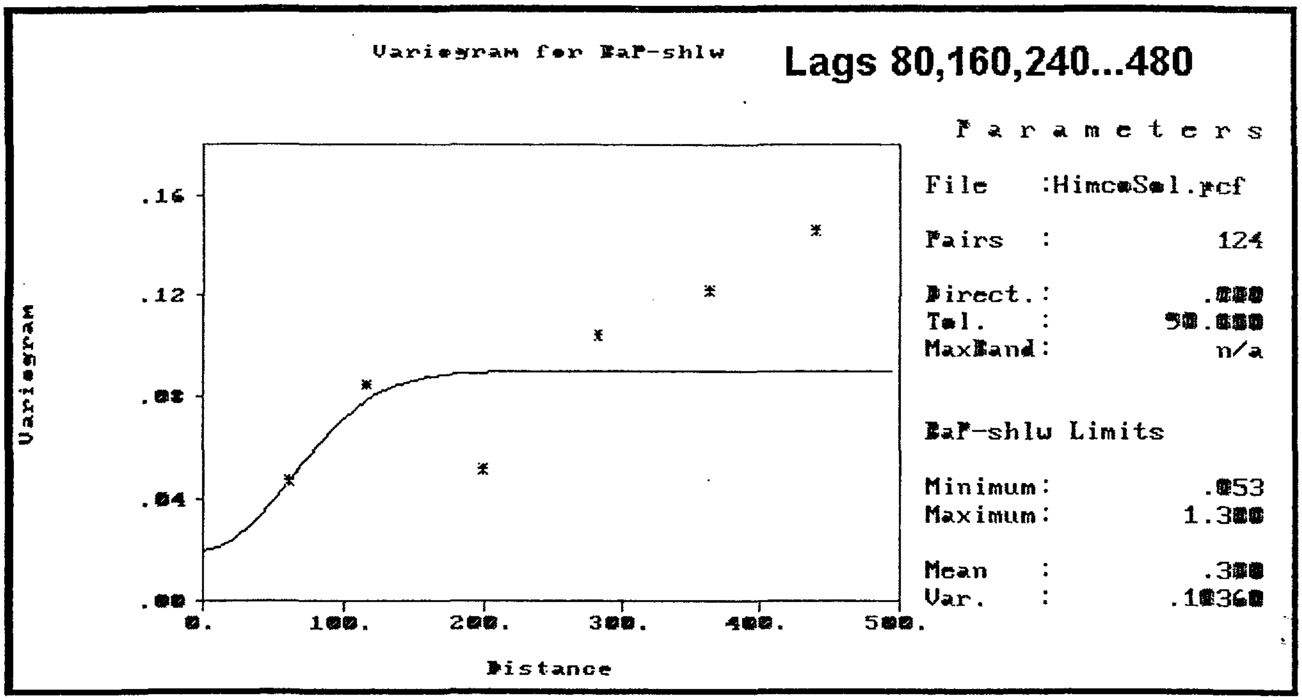
Pairs : 105

Direct. : .000
Tol. : 90.000
MaxBand : n/a

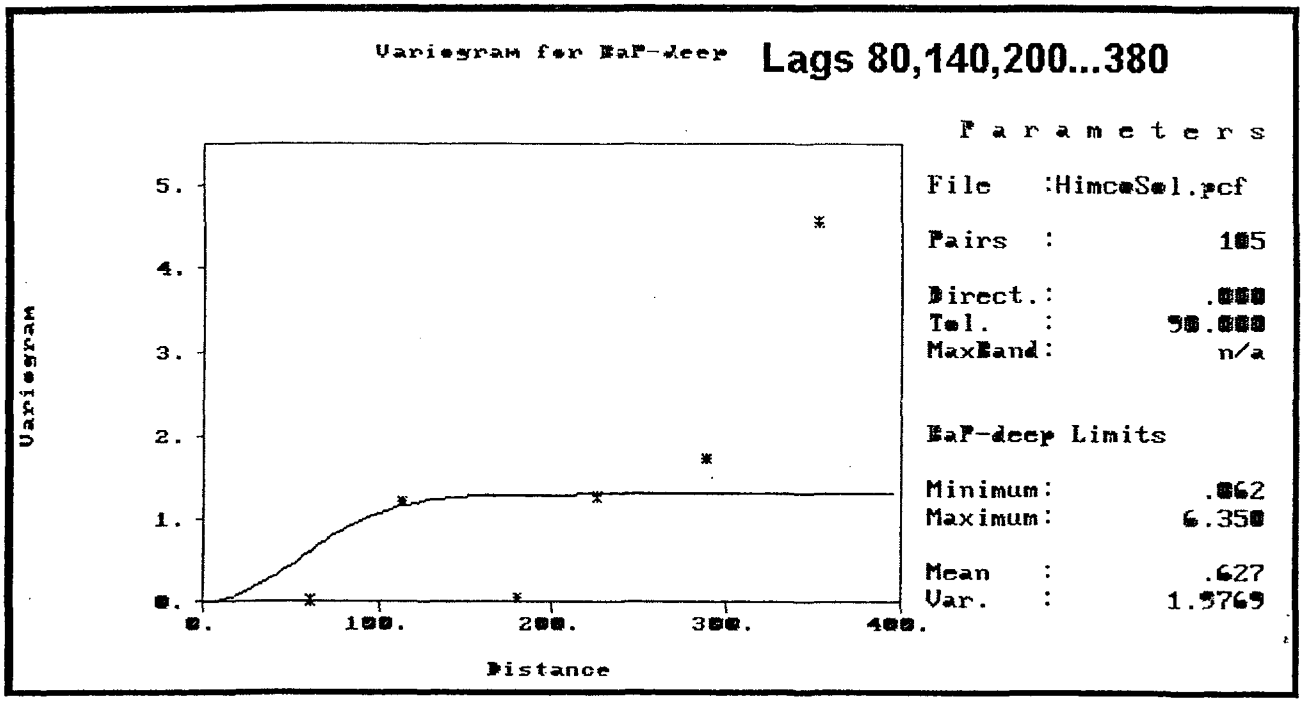
As-deep Limits

Minimum : .550
Maximum : 9.500

Mean : 2.515
Var. : 5.9505



Variogram for BaP-shlw
Lags 80,160,240...480
Variogram
.16
.12
.08
.04
.00
0.
100.
200.
300.
400.
500.
Distance
Parameters
File :HimcoSol.pcf
Pairs : 124
Direct. : .000
Tol. : 90.000
MaxBand : n/a
BaP-shlw Limits
Minimum : .053
Maximum : 1.300
Mean : .300
Var. : .10360



Variogram for BaP-deep
Lags 80,140,200...380
Parameters
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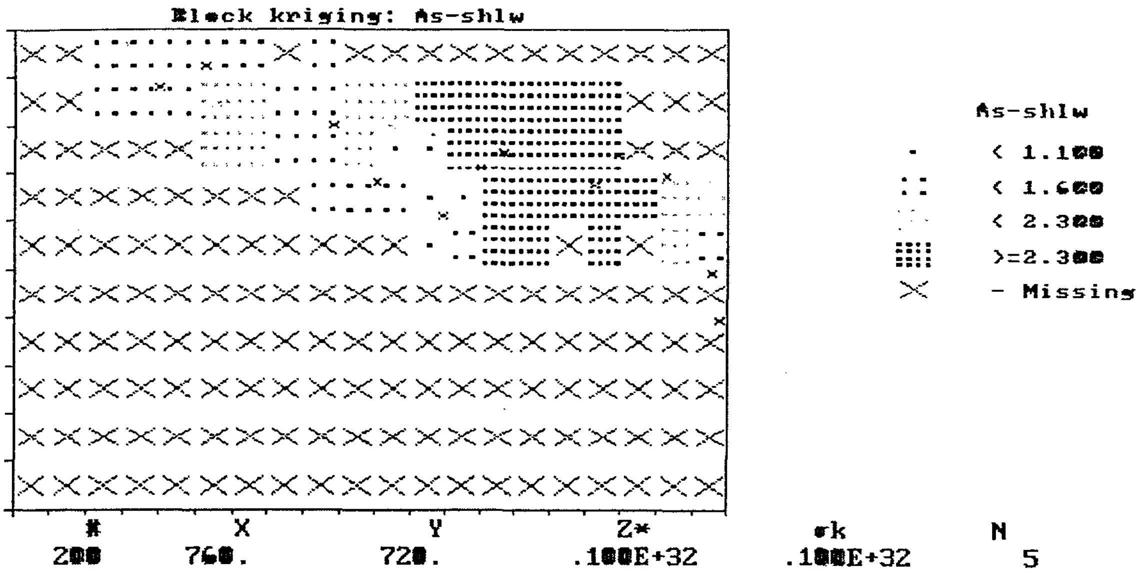
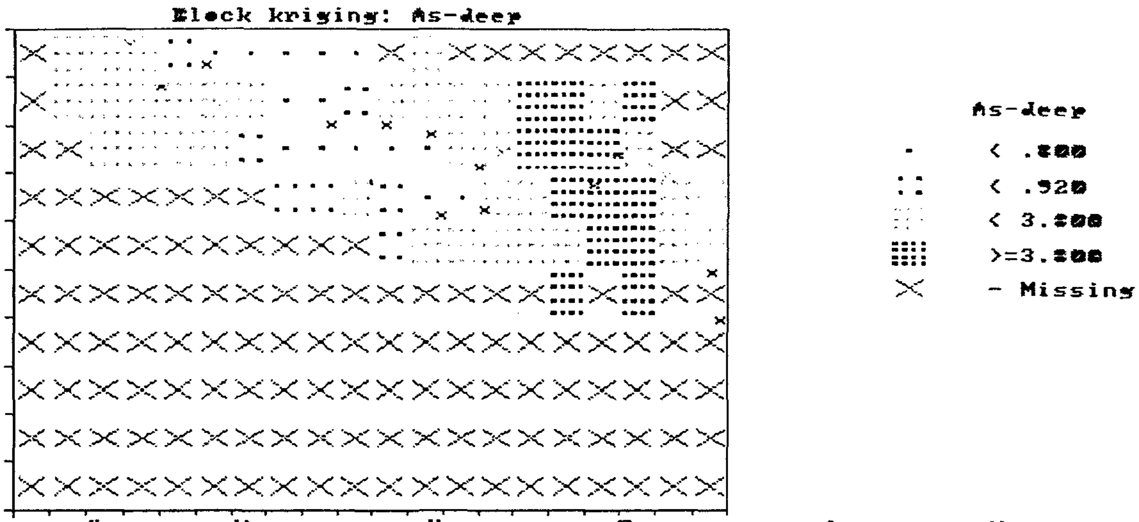
Pairs : 105
Direct. : .000
Tol. : 90.000
MaxBand : n/a
BaP-deep Limits
Minimum: .062
Maximum: 6.350
Mean : .627
Var. : 1.5769
Variogram
Distance
0.
1.
2.
3.
4.
5.
100.
200.
300.
400.

Himco SF Ord Block Kriging 2x2 As Shl

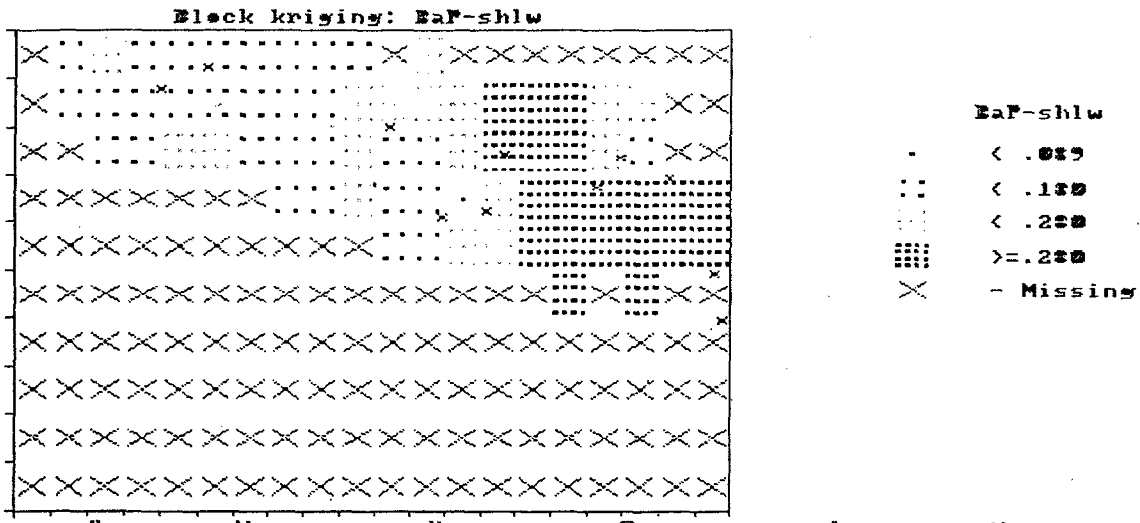


Himco - Block Kriging 2x2, As Deep



#	X	Y	Z*	σk	N
200	760.	720.	.100E+32	.100E+32	5

Himco SF Ord Blk Kriging 2x2, BaP shl



#	X	Y	Z*	σk	N
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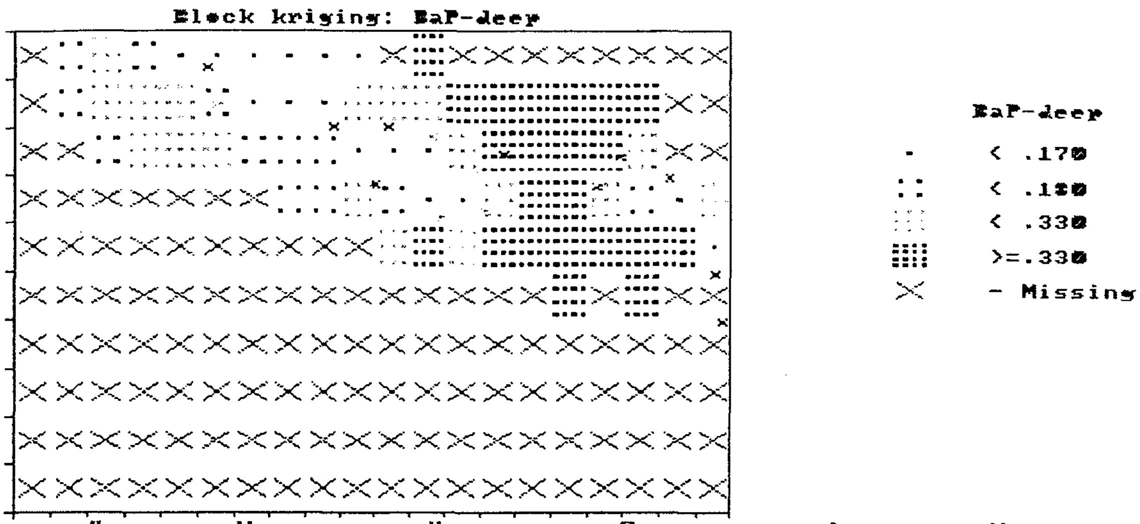
Himco SF Ord Blk Kriging 2x2, BaP deep



#	X	Y	Z*	σk	N
200	760.	720.	.100E+32	.100E+32	5

Himco Soil, Construction Debris Area
6
Easting feet F7.1 Measured from E406,000, N1531500
Northing feet F7.1
As-shlw ppm G16.9 Data for 0-0.5 feet
As-deep ppm G16.9 Average of 0.5-2, 2-4, and 4-6 foot samples
BaP-shlw ppm F10.3 Data for 0-0.5 feet
BaP-deep ppm F10.3 Average of 0.5-2, 2-4, and 4-6 foot samples

105.0	735.0	1.60	1.30	0.18	0.18	'SB-03'
140.0	663.0	1.00	0.85	0.175	0.193	'SB-04'
190.0	700.0	1.2	0.6	0.089	0.110	'SB-05'
200.0	635.0	2.1	1.1	0.18	0.18	'SB-06'
395.0	600.0	2.3	0.7	0.17	0.17	'SB-07'
332.0	600.0	1.1	0.55	0.18	0.17	'SB-08'
445.0	585.0	1.7	0.8	0.18	0.18	'SB-09'
380.0	505.0	1.5	0.92	0.18	0.17	'SB-10'
525.0	555.0	12.5	3.8	0.43	0.78	'SB-11'
500.0	530.0	1.1	0.8	0.18	0.26	'SB-12'
505.0	460.0	2.1	0.9	0.066	0.18	'SB-13'
455.0	450.0	0.83	0.85	0.053	0.18	'SB-14'
630.0	500.0	6.0	5.7	1.0	0.36	'SB-15'
657.0	550.0	3.9	4.7	0.053	0.33	'SB-16'
710.0	515.0	1.5	2.7	0.28	0.062	'SB-17'
760.0	355.0	1.5	4.1	0.28	0.5	'SB-18'
850.0	370.0	3.4	5.4	0.430	0.94	'SB-19'
770.0	275.0	5.8	9.5	1.3	6.35	'SB-20'

Kriging estimates produced from data file HimcoSol.grd
4
Easting feet F9.1
Northing feet F9.1
*As-deep ppm G18.9
KSDAs-deep G18.9

.0	.0	.1000000E+32	.1000000E+32
.0	80.0	.1000000E+32	.1000000E+32
.0	160.0	.1000000E+32	.1000000E+32
.0	240.0	.1000000E+32	.1000000E+32
.0	320.0	.1000000E+32	.1000000E+32
.0	400.0	.1000000E+32	.1000000E+32
.0	480.0	.1000000E+32	.1000000E+32
.0	560.0	.1000000E+32	.1000000E+32
.0	640.0	.1000000E+32	.1000000E+32
.0	720.0	.1000000E+32	.1000000E+32
40.0	.0	.1000000E+32	.1000000E+32
40.0	80.0	.1000000E+32	.1000000E+32
40.0	160.0	.1000000E+32	.1000000E+32
40.0	240.0	.1000000E+32	.1000000E+32
40.0	320.0	.1000000E+32	.1000000E+32
40.0	400.0	.1000000E+32	.1000000E+32
40.0	480.0	.1000000E+32	.1000000E+32
40.0	560.0	.1000000E+32	.1000000E+32
40.0	640.0	1.09876800	1.69777500
40.0	720.0	1.26157700	1.40171400
80.0	.0	.1000000E+32	.1000000E+32
80.0	80.0	.1000000E+32	.1000000E+32
80.0	160.0	.1000000E+32	.1000000E+32
80.0	240.0	.1000000E+32	.1000000E+32
80.0	320.0	.1000000E+32	.1000000E+32
80.0	400.0	.1000000E+32	.1000000E+32
80.0	480.0	.1000000E+32	.1000000E+32
80.0	560.0	1.07030900	1.80355800
80.0	640.0	1.05562700	1.34621700
80.0	720.0	1.27907100	.772247100
120.0	.0	.1000000E+32	.1000000E+32
120.0	80.0	.1000000E+32	.1000000E+32
120.0	160.0	.1000000E+32	.1000000E+32
120.0	240.0	.1000000E+32	.1000000E+32
120.0	320.0	.1000000E+32	.1000000E+32
120.0	400.0	.1000000E+32	.1000000E+32
120.0	480.0	.1000000E+32	.1000000E+32
120.0	560.0	1.09291700	1.69212900
120.0	640.0	.977511000	.804943600

120.0	720.0	1.10042800	.420780100
160.0	.0	.1000000E+32	.1000000E+32
160.0	80.0	.1000000E+32	.1000000E+32
160.0	160.0	.1000000E+32	.1000000E+32
160.0	240.0	.1000000E+32	.1000000E+32
160.0	320.0	.1000000E+32	.1000000E+32
160.0	400.0	.1000000E+32	.1000000E+32
160.0	480.0	.1000000E+32	.1000000E+32
160.0	560.0	1.03273600	1.48993600
160.0	640.0	.942508300	.500615700
160.0	720.0	.820166600	.581466300
200.0	.0	.1000000E+32	.1000000E+32
200.0	80.0	.1000000E+32	.1000000E+32
200.0	160.0	.1000000E+32	.1000000E+32
200.0	240.0	.1000000E+32	.1000000E+32
200.0	320.0	.1000000E+32	.1000000E+32
200.0	400.0	.1000000E+32	.1000000E+32
200.0	480.0	.1000000E+32	.1000000E+32
200.0	560.0	.986399000	1.39210700
200.0	640.0	.995256800	.379737800
200.0	720.0	.647429000	.646482800
240.0	.0	.1000000E+32	.1000000E+32
240.0	80.0	.1000000E+32	.1000000E+32
240.0	160.0	.1000000E+32	.1000000E+32
240.0	240.0	.1000000E+32	.1000000E+32
240.0	320.0	.1000000E+32	.1000000E+32
240.0	400.0	.1000000E+32	.1000000E+32
240.0	480.0	.1000000E+32	.1000000E+32
240.0	560.0	.900830400	1.39035800
240.0	640.0	.961112700	.828190400
240.0	720.0	.674256700	1.15487200
280.0	.0	.1000000E+32	.1000000E+32
280.0	80.0	.1000000E+32	.1000000E+32
280.0	160.0	.1000000E+32	.1000000E+32
280.0	240.0	.1000000E+32	.1000000E+32
280.0	320.0	.1000000E+32	.1000000E+32
280.0	400.0	.1000000E+32	.1000000E+32
280.0	480.0	.859193300	1.59161600
280.0	560.0	.753817600	1.20034900
280.0	640.0	.750098900	1.06746800
280.0	720.0	.762612500	1.51910300
320.0	.0	.1000000E+32	.1000000E+32
320.0	80.0	.1000000E+32	.1000000E+32
320.0	160.0	.1000000E+32	.1000000E+32
320.0	240.0	.1000000E+32	.1000000E+32

320.0	320.0	.1000000E+32	.1000000E+32
320.0	400.0	.1000000E+32	.1000000E+32
320.0	480.0	.837811100	1.31922700
320.0	560.0	.678439800	.836339200
320.0	640.0	.624428600	.949391600
320.0	720.0	.703130500	1.63038500
360.0	.0	.1000000E+32	.1000000E+32
360.0	80.0	.1000000E+32	.1000000E+32
360.0	160.0	.1000000E+32	.1000000E+32
360.0	240.0	.1000000E+32	.1000000E+32
360.0	320.0	.1000000E+32	.1000000E+32
360.0	400.0	.1000000E+32	.1000000E+32
360.0	480.0	1.30383200	.816033900
360.0	560.0	.710375900	.606941100
360.0	640.0	.801045200	.907012200
360.0	720.0	.716032000	1.66519400
400.0	.0	.1000000E+32	.1000000E+32
400.0	80.0	.1000000E+32	.1000000E+32
400.0	160.0	.1000000E+32	.1000000E+32
400.0	240.0	.1000000E+32	.1000000E+32
400.0	320.0	.1000000E+32	.1000000E+32
400.0	400.0	.860390100	1.43296300
400.0	480.0	.917460700	.568975900
400.0	560.0	.461143900	.556539700
400.0	640.0	1.00120200	.959931300
400.0	720.0	.1000000E+32	.1000000E+32
440.0	.0	.1000000E+32	.1000000E+32
440.0	80.0	.1000000E+32	.1000000E+32
440.0	160.0	.1000000E+32	.1000000E+32
440.0	240.0	.1000000E+32	.1000000E+32
440.0	320.0	.1000000E+32	.1000000E+32
440.0	400.0	1.64742600	1.13523000
440.0	480.0	.411550400	.553026300
440.0	560.0	.406334300	.501640400
440.0	640.0	1.31061000	1.11159300
440.0	720.0	1.66273100	1.76138900
480.0	.0	.1000000E+32	.1000000E+32
480.0	80.0	.1000000E+32	.1000000E+32
480.0	160.0	.1000000E+32	.1000000E+32
480.0	240.0	.1000000E+32	.1000000E+32
480.0	320.0	.1000000E+32	.1000000E+32
480.0	400.0	1.91845000	1.10034600
480.0	480.0	.346711700	.411448100
480.0	560.0	1.26138100	.429463500
480.0	640.0	2.09110200	1.25290800

480.0	720.0	.1000000E+32	.1000000E+32
520.0	.0	.1000000E+32	.1000000E+32
520.0	80.0	.1000000E+32	.1000000E+32
520.0	160.0	.1000000E+32	.1000000E+32
520.0	240.0	.1000000E+32	.1000000E+32
520.0	320.0	.1000000E+32	.1000000E+32
520.0	400.0	2.28765200	1.23737900
520.0	480.0	1.47772600	.476865400
520.0	560.0	3.13270200	.400813500
520.0	640.0	3.45492400	1.38633500
520.0	720.0	.1000000E+32	.1000000E+32
560.0	.0	.1000000E+32	.1000000E+32
560.0	80.0	.1000000E+32	.1000000E+32
560.0	160.0	.1000000E+32	.1000000E+32
560.0	240.0	.1000000E+32	.1000000E+32
560.0	320.0	.1000000E+32	.1000000E+32
560.0	400.0	2.90075000	1.44237600
560.0	480.0	3.39538100	.844537100
560.0	560.0	4.77549400	.730734400
560.0	640.0	3.81648300	1.47845000
560.0	720.0	.1000000E+32	.1000000E+32
600.0	.0	.1000000E+32	.1000000E+32
600.0	80.0	.1000000E+32	.1000000E+32
600.0	160.0	.1000000E+32	.1000000E+32
600.0	240.0	.1000000E+32	.1000000E+32
600.0	320.0	4.77212000	1.70765900
600.0	400.0	3.65032000	1.51258800
600.0	480.0	4.85397400	.757833900
600.0	560.0	5.45838000	.884211800
600.0	640.0	3.83191300	1.57840100
600.0	720.0	.1000000E+32	.1000000E+32
640.0	.0	.1000000E+32	.1000000E+32
640.0	80.0	.1000000E+32	.1000000E+32
640.0	160.0	.1000000E+32	.1000000E+32
640.0	240.0	.1000000E+32	.1000000E+32
640.0	320.0	.1000000E+32	.1000000E+32
640.0	400.0	4.39565700	1.50381300
640.0	480.0	5.00783300	.616085900
640.0	560.0	4.95300500	.567198300
640.0	640.0	3.75623100	1.58298800
640.0	720.0	.1000000E+32	.1000000E+32
680.0	.0	.1000000E+32	.1000000E+32
680.0	80.0	.1000000E+32	.1000000E+32
680.0	160.0	.1000000E+32	.1000000E+32
680.0	240.0	.1000000E+32	.1000000E+32

680.0	320.0	6.12069800	1.49523600
680.0	400.0	3.92533700	1.41625800
680.0	480.0	3.91924600	.779768300
680.0	560.0	3.78684600	.592934300
680.0	640.0	4.02250200	1.61475000
680.0	720.0	.1000000E+32	.1000000E+32
720.0	.0	.1000000E+32	.1000000E+32
720.0	80.0	.1000000E+32	.1000000E+32
720.0	160.0	.1000000E+32	.1000000E+32
720.0	240.0	.1000000E+32	.1000000E+32
720.0	320.0	.1000000E+32	.1000000E+32
720.0	400.0	3.69277300	1.16929500
720.0	480.0	3.08465500	.823924100
720.0	560.0	.1000000E+32	.1000000E+32
720.0	640.0	.1000000E+32	.1000000E+32
720.0	720.0	.1000000E+32	.1000000E+32
760.0	.0	.1000000E+32	.1000000E+32
760.0	80.0	.1000000E+32	.1000000E+32
760.0	160.0	.1000000E+32	.1000000E+32
760.0	240.0	.1000000E+32	.1000000E+32
760.0	320.0	.1000000E+32	.1000000E+32
760.0	400.0	3.54594300	.949478100
760.0	480.0	3.21387900	1.19590300
760.0	560.0	.1000000E+32	.1000000E+32
760.0	640.0	.1000000E+32	.1000000E+32
760.0	720.0	.1000000E+32	.1000000E+32

Kriging estimates produced from data file himcosol.grd
4
Easting feet F8.1
Northing feet F8.1
*As-shlw ppm G17.9
KSDAs-shlw G17.9

.0	.0	.1000000E+32	.1000000E+32
.0	80.0	.1000000E+32	.1000000E+32
.0	160.0	.1000000E+32	.1000000E+32
.0	240.0	.1000000E+32	.1000000E+32
.0	320.0	.1000000E+32	.1000000E+32
.0	400.0	.1000000E+32	.1000000E+32
.0	480.0	.1000000E+32	.1000000E+32
.0	560.0	.1000000E+32	.1000000E+32
.0	640.0	.1000000E+32	.1000000E+32
.0	720.0	.1000000E+32	.1000000E+32
40.0	.0	.1000000E+32	.1000000E+32
40.0	80.0	.1000000E+32	.1000000E+32
40.0	160.0	.1000000E+32	.1000000E+32
40.0	240.0	.1000000E+32	.1000000E+32
40.0	320.0	.1000000E+32	.1000000E+32
40.0	400.0	.1000000E+32	.1000000E+32
40.0	480.0	.1000000E+32	.1000000E+32
40.0	560.0	.1000000E+32	.1000000E+32
40.0	640.0	1.50640500	1.48571300
40.0	720.0	1.69450600	1.23402200
80.0	.0	.1000000E+32	.1000000E+32
80.0	80.0	.1000000E+32	.1000000E+32
80.0	160.0	.1000000E+32	.1000000E+32
80.0	240.0	.1000000E+32	.1000000E+32
80.0	320.0	.1000000E+32	.1000000E+32
80.0	400.0	.1000000E+32	.1000000E+32
80.0	480.0	.1000000E+32	.1000000E+32
80.0	560.0	1.57079100	1.57691800
80.0	640.0	1.30474800	1.18555300
80.0	720.0	1.57146900	.699767700
120.0	.0	.1000000E+32	.1000000E+32
120.0	80.0	.1000000E+32	.1000000E+32
120.0	160.0	.1000000E+32	.1000000E+32
120.0	240.0	.1000000E+32	.1000000E+32
120.0	320.0	.1000000E+32	.1000000E+32
120.0	400.0	.1000000E+32	.1000000E+32
120.0	480.0	.1000000E+32	.1000000E+32
120.0	560.0	1.62637400	1.48110800
120.0	640.0	1.21348200	.728943100

120.0	720.0	1.34149400	.402007700
160.0	.0	.1000000E+32	.1000000E+32
160.0	80.0	.1000000E+32	.1000000E+32
160.0	160.0	.1000000E+32	.1000000E+32
160.0	240.0	.1000000E+32	.1000000E+32
160.0	320.0	.1000000E+32	.1000000E+32
160.0	400.0	.1000000E+32	.1000000E+32
160.0	480.0	.1000000E+32	.1000000E+32
160.0	560.0	1.67974900	1.30652200
160.0	640.0	1.45482800	.465053200
160.0	720.0	1.21408000	.531326900
200.0	.0	.1000000E+32	.1000000E+32
200.0	80.0	.1000000E+32	.1000000E+32
200.0	160.0	.1000000E+32	.1000000E+32
200.0	240.0	.1000000E+32	.1000000E+32
200.0	320.0	.1000000E+32	.1000000E+32
200.0	400.0	.1000000E+32	.1000000E+32
200.0	480.0	.1000000E+32	.1000000E+32
200.0	560.0	1.77503500	1.22310900
200.0	640.0	1.86259200	.373194800
200.0	720.0	1.27062900	.597966300
240.0	.0	.1000000E+32	.1000000E+32
240.0	80.0	.1000000E+32	.1000000E+32
240.0	160.0	.1000000E+32	.1000000E+32
240.0	240.0	.1000000E+32	.1000000E+32
240.0	320.0	.1000000E+32	.1000000E+32
240.0	400.0	.1000000E+32	.1000000E+32
240.0	480.0	.1000000E+32	.1000000E+32
240.0	560.0	1.66417800	1.22084300
240.0	640.0	1.86519800	.746266400
240.0	720.0	1.39367200	1.02313800
280.0	.0	.1000000E+32	.1000000E+32
280.0	80.0	.1000000E+32	.1000000E+32
280.0	160.0	.1000000E+32	.1000000E+32
280.0	240.0	.1000000E+32	.1000000E+32
280.0	320.0	.1000000E+32	.1000000E+32
280.0	400.0	.1000000E+32	.1000000E+32
280.0	480.0	1.48543500	1.39194100
280.0	560.0	1.20309500	1.06162700
280.0	640.0	1.36067900	.948926800
280.0	720.0	1.55419400	1.33024900
320.0	.0	.1000000E+32	.1000000E+32
320.0	80.0	.1000000E+32	.1000000E+32
320.0	160.0	.1000000E+32	.1000000E+32
320.0	240.0	.1000000E+32	.1000000E+32

320.0	320.0	.1000000E+32	.1000000E+32
320.0	400.0	.1000000E+32	.1000000E+32
320.0	480.0	1.42858600	1.16040300
320.0	560.0	1.19321000	.749729300
320.0	640.0	1.24754200	.845938600
320.0	720.0	1.38135700	1.42549800
360.0	.0	.1000000E+32	.1000000E+32
360.0	80.0	.1000000E+32	.1000000E+32
360.0	160.0	.1000000E+32	.1000000E+32
360.0	240.0	.1000000E+32	.1000000E+32
360.0	320.0	.1000000E+32	.1000000E+32
360.0	400.0	.1000000E+32	.1000000E+32
360.0	480.0	2.81702600	.735042800
360.0	560.0	1.63570300	.549007100
360.0	640.0	2.30336400	.805499000
360.0	720.0	1.55309500	1.45529400
400.0	.0	.1000000E+32	.1000000E+32
400.0	80.0	.1000000E+32	.1000000E+32
400.0	160.0	.1000000E+32	.1000000E+32
400.0	240.0	.1000000E+32	.1000000E+32
400.0	320.0	.1000000E+32	.1000000E+32
400.0	400.0	.984418400	1.25943700
400.0	480.0	1.22287800	.526616400
400.0	560.0	.746102000	.504326200
400.0	640.0	3.07119000	.852109200
400.0	720.0	.1000000E+32	.1000000E+32
440.0	.0	.1000000E+32	.1000000E+32
440.0	80.0	.1000000E+32	.1000000E+32
440.0	160.0	.1000000E+32	.1000000E+32
440.0	240.0	.1000000E+32	.1000000E+32
440.0	320.0	.1000000E+32	.1000000E+32
440.0	400.0	3.75327100	1.00829100
440.0	480.0	-.497963800	.510820800
440.0	560.0	.307268800	.465131300
440.0	640.0	3.81494900	.979385300
440.0	720.0	5.06951400	1.53959700
480.0	.0	.1000000E+32	.1000000E+32
480.0	80.0	.1000000E+32	.1000000E+32
480.0	160.0	.1000000E+32	.1000000E+32
480.0	240.0	.1000000E+32	.1000000E+32
480.0	320.0	.1000000E+32	.1000000E+32
480.0	400.0	3.85915100	.973503600
480.0	480.0	-.317070400E-01	.386942500
480.0	560.0	3.36223000	.405285100
480.0	640.0	6.13682700	1.10793600

480.0	720.0	.1000000E+32	.1000000E+32
520.0	.0	.1000000E+32	.1000000E+32
520.0	80.0	.1000000E+32	.1000000E+32
520.0	160.0	.1000000E+32	.1000000E+32
520.0	240.0	.1000000E+32	.1000000E+32
520.0	320.0	.1000000E+32	.1000000E+32
520.0	400.0	4.79375600	1.09296400
520.0	480.0	3.24673200	.449687900
520.0	560.0	9.24508900	.385252600
520.0	640.0	8.88116600	1.22217500
520.0	720.0	.1000000E+32	.1000000E+32
560.0	.0	.1000000E+32	.1000000E+32
560.0	80.0	.1000000E+32	.1000000E+32
560.0	160.0	.1000000E+32	.1000000E+32
560.0	240.0	.1000000E+32	.1000000E+32
560.0	320.0	.1000000E+32	.1000000E+32
560.0	400.0	5.07646100	1.26691100
560.0	480.0	6.32755700	.760464500
560.0	560.0	12.1301900	.669914400
560.0	640.0	9.30925300	1.30084600
560.0	720.0	.1000000E+32	.1000000E+32
600.0	.0	.1000000E+32	.1000000E+32
600.0	80.0	.1000000E+32	.1000000E+32
600.0	160.0	.1000000E+32	.1000000E+32
600.0	240.0	.1000000E+32	.1000000E+32
600.0	320.0	3.81733200	1.49278600
600.0	400.0	4.54842900	1.32429600
600.0	480.0	6.68890400	.689772100
600.0	560.0	9.83442200	.793134700
600.0	640.0	6.87726200	1.38224200
600.0	720.0	.1000000E+32	.1000000E+32
640.0	.0	.1000000E+32	.1000000E+32
640.0	80.0	.1000000E+32	.1000000E+32
640.0	160.0	.1000000E+32	.1000000E+32
640.0	240.0	.1000000E+32	.1000000E+32
640.0	320.0	.1000000E+32	.1000000E+32
640.0	400.0	3.64849900	1.31667800
640.0	480.0	4.91333200	.568536600
640.0	560.0	5.71633600	.528842700
640.0	640.0	5.13356400	1.38698200
640.0	720.0	.1000000E+32	.1000000E+32
680.0	.0	.1000000E+32	.1000000E+32
680.0	80.0	.1000000E+32	.1000000E+32
680.0	160.0	.1000000E+32	.1000000E+32
680.0	240.0	.1000000E+32	.1000000E+32

680.0	320.0	3.92278300	1.30913600
680.0	400.0	2.78497600	1.24106600
680.0	480.0	3.02709100	.699291500
680.0	560.0	2.86756300	.546800300
680.0	640.0	6.08831000	1.41492000
680.0	720.0	.1000000E+32	.1000000E+32
720.0	.0	.1000000E+32	.1000000E+32
720.0	80.0	.1000000E+32	.1000000E+32
720.0	160.0	.1000000E+32	.1000000E+32
720.0	240.0	.1000000E+32	.1000000E+32
720.0	320.0	.1000000E+32	.1000000E+32
720.0	400.0	1.91261200	1.03259500
720.0	480.0	1.84130200	.743938700
720.0	560.0	.1000000E+32	.1000000E+32
720.0	640.0	.1000000E+32	.1000000E+32
720.0	720.0	.1000000E+32	.1000000E+32
760.0	.0	.1000000E+32	.1000000E+32
760.0	80.0	.1000000E+32	.1000000E+32
760.0	160.0	.1000000E+32	.1000000E+32
760.0	240.0	.1000000E+32	.1000000E+32
760.0	320.0	.1000000E+32	.1000000E+32
760.0	400.0	1.57442400	.845612900
760.0	480.0	1.65511100	1.05742800
760.0	560.0	.1000000E+32	.1000000E+32
760.0	640.0	.1000000E+32	.1000000E+32
760.0	720.0	.1000000E+32	.1000000E+32

Kriging estimates produced from data file HimcoSol.grd
4
Easting feet F8.1
Northing feet F8.1
*BaP-deep ppm F11.3
KSDBaP-dee F11.3

.0	.0	.1000000E+32	.1000000E+32
.0	80.0	.1000000E+32	.1000000E+32
.0	160.0	.1000000E+32	.1000000E+32
.0	240.0	.1000000E+32	.1000000E+32
.0	320.0	.1000000E+32	.1000000E+32
.0	400.0	.1000000E+32	.1000000E+32
.0	480.0	.1000000E+32	.1000000E+32
.0	560.0	.1000000E+32	.1000000E+32
.0	640.0	.1000000E+32	.1000000E+32
.0	720.0	.1000000E+32	.1000000E+32
40.0	.0	.1000000E+32	.1000000E+32
40.0	80.0	.1000000E+32	.1000000E+32
40.0	160.0	.1000000E+32	.1000000E+32
40.0	240.0	.1000000E+32	.1000000E+32
40.0	320.0	.1000000E+32	.1000000E+32
40.0	400.0	.1000000E+32	.1000000E+32
40.0	480.0	.1000000E+32	.1000000E+32
40.0	560.0	.1000000E+32	.1000000E+32
40.0	640.0	.178	1.229
40.0	720.0	.179	1.042
80.0	.0	.1000000E+32	.1000000E+32
80.0	80.0	.1000000E+32	.1000000E+32
80.0	160.0	.1000000E+32	.1000000E+32
80.0	240.0	.1000000E+32	.1000000E+32
80.0	320.0	.1000000E+32	.1000000E+32
80.0	400.0	.1000000E+32	.1000000E+32
80.0	480.0	.1000000E+32	.1000000E+32
80.0	560.0	.175	1.279
80.0	640.0	.194	1.013
80.0	720.0	.188	.541
120.0	.0	.1000000E+32	.1000000E+32
120.0	80.0	.1000000E+32	.1000000E+32
120.0	160.0	.1000000E+32	.1000000E+32
120.0	240.0	.1000000E+32	.1000000E+32
120.0	320.0	.1000000E+32	.1000000E+32
120.0	400.0	.1000000E+32	.1000000E+32
120.0	480.0	.1000000E+32	.1000000E+32
120.0	560.0	.181	1.225
120.0	640.0	.203	.561

120.0	720.0	.175	.233
160.0	.0	.1000000E+32	.1000000E+32
160.0	80.0	.1000000E+32	.1000000E+32
160.0	160.0	.1000000E+32	.1000000E+32
160.0	240.0	.1000000E+32	.1000000E+32
160.0	320.0	.1000000E+32	.1000000E+32
160.0	400.0	.1000000E+32	.1000000E+32
160.0	480.0	.1000000E+32	.1000000E+32
160.0	560.0	.184	1.096
160.0	640.0	.191	.323
160.0	720.0	.136	.426
200.0	.0	.1000000E+32	.1000000E+32
200.0	80.0	.1000000E+32	.1000000E+32
200.0	160.0	.1000000E+32	.1000000E+32
200.0	240.0	.1000000E+32	.1000000E+32
200.0	320.0	.1000000E+32	.1000000E+32
200.0	400.0	.1000000E+32	.1000000E+32
200.0	480.0	.1000000E+32	.1000000E+32
200.0	560.0	.180	1.035
200.0	640.0	.171	.070
200.0	720.0	.109	.401
240.0	.0	.1000000E+32	.1000000E+32
240.0	80.0	.1000000E+32	.1000000E+32
240.0	160.0	.1000000E+32	.1000000E+32
240.0	240.0	.1000000E+32	.1000000E+32
240.0	320.0	.1000000E+32	.1000000E+32
240.0	400.0	.1000000E+32	.1000000E+32
240.0	480.0	.1000000E+32	.1000000E+32
240.0	560.0	.175	1.051
240.0	640.0	.165	.638
240.0	720.0	.123	.872
280.0	.0	.1000000E+32	.1000000E+32
280.0	80.0	.1000000E+32	.1000000E+32
280.0	160.0	.1000000E+32	.1000000E+32
280.0	240.0	.1000000E+32	.1000000E+32
280.0	320.0	.1000000E+32	.1000000E+32
280.0	400.0	.1000000E+32	.1000000E+32
280.0	480.0	.174	1.151
280.0	560.0	.173	.913
280.0	640.0	.168	.843
280.0	720.0	.151	1.122
320.0	.0	.1000000E+32	.1000000E+32
320.0	80.0	.1000000E+32	.1000000E+32
320.0	160.0	.1000000E+32	.1000000E+32
320.0	240.0	.1000000E+32	.1000000E+32

320.0	320.0	.1000000E+32	.1000000E+32
320.0	400.0	.1000000E+32	.1000000E+32
320.0	480.0	.177	.979
320.0	560.0	.172	.623
320.0	640.0	.169	.695
320.0	720.0	.165	1.176
360.0	.0	.1000000E+32	.1000000E+32
360.0	80.0	.1000000E+32	.1000000E+32
360.0	160.0	.1000000E+32	.1000000E+32
360.0	240.0	.1000000E+32	.1000000E+32
360.0	320.0	.1000000E+32	.1000000E+32
360.0	400.0	.1000000E+32	.1000000E+32
360.0	480.0	.242	.577
360.0	560.0	.167	.476
360.0	640.0	.204	.678
360.0	720.0	.162	1.194
400.0	.0	.1000000E+32	.1000000E+32
400.0	80.0	.1000000E+32	.1000000E+32
400.0	160.0	.1000000E+32	.1000000E+32
400.0	240.0	.1000000E+32	.1000000E+32
400.0	320.0	.1000000E+32	.1000000E+32
400.0	400.0	.192	1.058
400.0	480.0	.171	.398
400.0	560.0	.108	.427
400.0	640.0	.236	.700
400.0	720.0	.1000000E+32	.1000000E+32
440.0	.0	.1000000E+32	.1000000E+32
440.0	80.0	.1000000E+32	.1000000E+32
440.0	160.0	.1000000E+32	.1000000E+32
440.0	240.0	.1000000E+32	.1000000E+32
440.0	320.0	.1000000E+32	.1000000E+32
440.0	400.0	.330	.832
440.0	480.0	.067	.380
440.0	560.0	.071	.329
440.0	640.0	.276	.836
440.0	720.0	.368	1.250
480.0	.0	.1000000E+32	.1000000E+32
480.0	80.0	.1000000E+32	.1000000E+32
480.0	160.0	.1000000E+32	.1000000E+32
480.0	240.0	.1000000E+32	.1000000E+32
480.0	320.0	.1000000E+32	.1000000E+32
480.0	400.0	.328	.824
480.0	480.0	.057	.240
480.0	560.0	.282	.261
480.0	640.0	.424	.918

480.0	720.0	.1000000E+32	.1000000E+32
520.0	.0	.1000000E+32	.1000000E+32
520.0	80.0	.1000000E+32	.1000000E+32
520.0	160.0	.1000000E+32	.1000000E+32
520.0	240.0	.1000000E+32	.1000000E+32
520.0	320.0	.1000000E+32	.1000000E+32
520.0	400.0	.363	.912
520.0	480.0	.240	.274
520.0	560.0	.713	.145
520.0	640.0	.598	1.013
520.0	720.0	.1000000E+32	.1000000E+32
560.0	.0	.1000000E+32	.1000000E+32
560.0	80.0	.1000000E+32	.1000000E+32
560.0	160.0	.1000000E+32	.1000000E+32
560.0	240.0	.1000000E+32	.1000000E+32
560.0	320.0	.1000000E+32	.1000000E+32
560.0	400.0	.358	1.065
560.0	480.0	.414	.679
560.0	560.0	.875	.489
560.0	640.0	.601	1.073
560.0	720.0	.1000000E+32	.1000000E+32
600.0	.0	.1000000E+32	.1000000E+32
600.0	80.0	.1000000E+32	.1000000E+32
600.0	160.0	.1000000E+32	.1000000E+32
600.0	240.0	.1000000E+32	.1000000E+32
600.0	320.0	1.649	1.209
600.0	400.0	.380	1.110
600.0	480.0	.414	.559
600.0	560.0	.682	.700
600.0	640.0	.446	1.155
600.0	720.0	.1000000E+32	.1000000E+32
640.0	.0	.1000000E+32	.1000000E+32
640.0	80.0	.1000000E+32	.1000000E+32
640.0	160.0	.1000000E+32	.1000000E+32
640.0	240.0	.1000000E+32	.1000000E+32
640.0	320.0	.1000000E+32	.1000000E+32
640.0	400.0	1.101	1.109
640.0	480.0	.310	.387
640.0	560.0	.434	.343
640.0	640.0	.382	1.161
640.0	720.0	.1000000E+32	.1000000E+32
680.0	.0	.1000000E+32	.1000000E+32
680.0	80.0	.1000000E+32	.1000000E+32
680.0	160.0	.1000000E+32	.1000000E+32
680.0	240.0	.1000000E+32	.1000000E+32

680.0	320.0	2.116	1.102
680.0	400.0	.723	1.063
680.0	480.0	.179	.590
680.0	560.0	.250	.382
680.0	640.0	.430	1.176
680.0	720.0	.1000000E+32	.1000000E+32
720.0	.0	.1000000E+32	.1000000E+32
720.0	80.0	.1000000E+32	.1000000E+32
720.0	160.0	.1000000E+32	.1000000E+32
720.0	240.0	.1000000E+32	.1000000E+32
720.0	320.0	.1000000E+32	.1000000E+32
720.0	400.0	.330	.901
720.0	480.0	.154	.597
720.0	560.0	.1000000E+32	.1000000E+32
720.0	640.0	.1000000E+32	.1000000E+32
720.0	720.0	.1000000E+32	.1000000E+32
760.0	.0	.1000000E+32	.1000000E+32
760.0	80.0	.1000000E+32	.1000000E+32
760.0	160.0	.1000000E+32	.1000000E+32
760.0	240.0	.1000000E+32	.1000000E+32
760.0	320.0	.1000000E+32	.1000000E+32
760.0	400.0	.033	.719
760.0	480.0	.271	.917
760.0	560.0	.1000000E+32	.1000000E+32
760.0	640.0	.1000000E+32	.1000000E+32
760.0	720.0	.1000000E+32	.1000000E+32

Kriging estimates produced from data file HimcoSol.grd
4
Easting feet F8.1
Northing feet F8.1
*BaP-shlw ppm F11.3
KSDBaP-shl F11.3

.0	.0	.1000000E+32	.1000000E+32
.0	80.0	.1000000E+32	.1000000E+32
.0	160.0	.1000000E+32	.1000000E+32
.0	240.0	.1000000E+32	.1000000E+32
.0	320.0	.1000000E+32	.1000000E+32
.0	400.0	.1000000E+32	.1000000E+32
.0	480.0	.1000000E+32	.1000000E+32
.0	560.0	.1000000E+32	.1000000E+32
.0	640.0	.1000000E+32	.1000000E+32
.0	720.0	.1000000E+32	.1000000E+32
40.0	.0	.1000000E+32	.1000000E+32
40.0	80.0	.1000000E+32	.1000000E+32
40.0	160.0	.1000000E+32	.1000000E+32
40.0	240.0	.1000000E+32	.1000000E+32
40.0	320.0	.1000000E+32	.1000000E+32
40.0	400.0	.1000000E+32	.1000000E+32
40.0	480.0	.1000000E+32	.1000000E+32
40.0	560.0	.1000000E+32	.1000000E+32
40.0	640.0	.172	.292
40.0	720.0	.177	.251
80.0	.0	.1000000E+32	.1000000E+32
80.0	80.0	.1000000E+32	.1000000E+32
80.0	160.0	.1000000E+32	.1000000E+32
80.0	240.0	.1000000E+32	.1000000E+32
80.0	320.0	.1000000E+32	.1000000E+32
80.0	400.0	.1000000E+32	.1000000E+32
80.0	480.0	.1000000E+32	.1000000E+32
80.0	560.0	.169	.309
80.0	640.0	.179	.241
80.0	720.0	.180	.162
120.0	.0	.1000000E+32	.1000000E+32
120.0	80.0	.1000000E+32	.1000000E+32
120.0	160.0	.1000000E+32	.1000000E+32
120.0	240.0	.1000000E+32	.1000000E+32
120.0	320.0	.1000000E+32	.1000000E+32
120.0	400.0	.1000000E+32	.1000000E+32
120.0	480.0	.1000000E+32	.1000000E+32
120.0	560.0	.174	.292
120.0	640.0	.179	.166

120.0	720.0	.164	.111
160.0	.0	.1000000E+32	.1000000E+32
160.0	80.0	.1000000E+32	.1000000E+32
160.0	160.0	.1000000E+32	.1000000E+32
160.0	240.0	.1000000E+32	.1000000E+32
160.0	320.0	.1000000E+32	.1000000E+32
160.0	400.0	.1000000E+32	.1000000E+32
160.0	480.0	.1000000E+32	.1000000E+32
160.0	560.0	.182	.259
160.0	640.0	.171	.117
160.0	720.0	.133	.127
200.0	.0	.1000000E+32	.1000000E+32
200.0	80.0	.1000000E+32	.1000000E+32
200.0	160.0	.1000000E+32	.1000000E+32
200.0	240.0	.1000000E+32	.1000000E+32
200.0	320.0	.1000000E+32	.1000000E+32
200.0	400.0	.1000000E+32	.1000000E+32
200.0	480.0	.1000000E+32	.1000000E+32
200.0	560.0	.180	.245
200.0	640.0	.163	.108
200.0	720.0	.115	.146
240.0	.0	.1000000E+32	.1000000E+32
240.0	80.0	.1000000E+32	.1000000E+32
240.0	160.0	.1000000E+32	.1000000E+32
240.0	240.0	.1000000E+32	.1000000E+32
240.0	320.0	.1000000E+32	.1000000E+32
240.0	400.0	.1000000E+32	.1000000E+32
240.0	480.0	.1000000E+32	.1000000E+32
240.0	560.0	.178	.244
240.0	640.0	.164	.167
240.0	720.0	.125	.213
280.0	.0	.1000000E+32	.1000000E+32
280.0	80.0	.1000000E+32	.1000000E+32
280.0	160.0	.1000000E+32	.1000000E+32
280.0	240.0	.1000000E+32	.1000000E+32
280.0	320.0	.1000000E+32	.1000000E+32
280.0	400.0	.1000000E+32	.1000000E+32
280.0	480.0	.159	.273
280.0	560.0	.178	.219
280.0	640.0	.169	-.200
280.0	720.0	.147	.262
320.0	.0	.1000000E+32	.1000000E+32
320.0	80.0	.1000000E+32	.1000000E+32
320.0	160.0	.1000000E+32	.1000000E+32
320.0	240.0	.1000000E+32	.1000000E+32

320.0	320.0	.1000000E+32	.1000000E+32
320.0	400.0	.1000000E+32	.1000000E+32
320.0	480.0	.164	.234
320.0	560.0	.180	.165
320.0	640.0	.172	.181
320.0	720.0	.159	.279
360.0	.0	.1000000E+32	.1000000E+32
360.0	80.0	.1000000E+32	.1000000E+32
360.0	160.0	.1000000E+32	.1000000E+32
360.0	240.0	.1000000E+32	.1000000E+32
360.0	320.0	.1000000E+32	.1000000E+32
360.0	400.0	.1000000E+32	.1000000E+32
360.0	480.0	.185	.166
360.0	560.0	.182	.127
360.0	640.0	.183	.171
360.0	720.0	.159	.284
400.0	.0	.1000000E+32	.1000000E+32
400.0	80.0	.1000000E+32	.1000000E+32
400.0	160.0	.1000000E+32	.1000000E+32
400.0	240.0	.1000000E+32	.1000000E+32
400.0	320.0	.1000000E+32	.1000000E+32
400.0	400.0	.111	.253
400.0	480.0	.144	.131
400.0	560.0	.165	.117
400.0	640.0	.193	.179
400.0	720.0	.1000000E+32	.1000000E+32
440.0	.0	.1000000E+32	.1000000E+32
440.0	80.0	.1000000E+32	.1000000E+32
440.0	160.0	.1000000E+32	.1000000E+32
440.0	240.0	.1000000E+32	.1000000E+32
440.0	320.0	.1000000E+32	.1000000E+32
440.0	400.0	.126	.211
440.0	480.0	.098	.124
440.0	560.0	.171	.115
440.0	640.0	.211	.200
440.0	720.0	.254	.301
480.0	.0	.1000000E+32	.1000000E+32
480.0	80.0	.1000000E+32	.1000000E+32
480.0	160.0	.1000000E+32	.1000000E+32
480.0	240.0	.1000000E+32	.1000000E+32
480.0	320.0	.1000000E+32	.1000000E+32
480.0	400.0	.198	.201
480.0	480.0	.086	.100
480.0	560.0	.221	.105
480.0	640.0	.237	.226

480.0	720.0	.1000000E+32	.1000000E+32
520.0	.0	.1000000E+32	.1000000E+32
520.0	80.0	.1000000E+32	.1000000E+32
520.0	160.0	.1000000E+32	.1000000E+32
520.0	240.0	.1000000E+32	.1000000E+32
520.0	320.0	.1000000E+32	.1000000E+32
520.0	400.0	.263	.223
520.0	480.0	.225	.116
520.0	560.0	.339	.105
520.0	640.0	.310	.245
520.0	720.0	.1000000E+32	.1000000E+32
560.0	.0	.1000000E+32	.1000000E+32
560.0	80.0	.1000000E+32	.1000000E+32
560.0	160.0	.1000000E+32	.1000000E+32
560.0	240.0	.1000000E+32	.1000000E+32
560.0	320.0	.1000000E+32	.1000000E+32
560.0	400.0	.331	.252
560.0	480.0	.499	.168
560.0	560.0	.439	.155
560.0	640.0	.302	.259
560.0	720.0	.1000000E+32	.1000000E+32
600.0	.0	.1000000E+32	.1000000E+32
600.0	80.0	.1000000E+32	.1000000E+32
600.0	160.0	.1000000E+32	.1000000E+32
600.0	240.0	.1000000E+32	.1000000E+32
600.0	320.0	.638	.292
600.0	400.0	.452	.260
600.0	480.0	.731	.159
600.0	560.0	.421	.172
600.0	640.0	.287	.272
600.0	720.0	.1000000E+32	.1000000E+32
640.0	.0	.1000000E+32	.1000000E+32
640.0	80.0	.1000000E+32	.1000000E+32
640.0	160.0	.1000000E+32	.1000000E+32
640.0	240.0	.1000000E+32	.1000000E+32
640.0	320.0	.1000000E+32	.1000000E+32
640.0	400.0	.604	.259
640.0	480.0	.736	.138
640.0	560.0	.275	.132
640.0	640.0	.232	.274
640.0	720.0	.1000000E+32	.1000000E+32
680.0	.0	.1000000E+32	.1000000E+32
680.0	80.0	.1000000E+32	.1000000E+32
680.0	160.0	.1000000E+32	.1000000E+32
680.0	240.0	.1000000E+32	.1000000E+32

680.0	320.0	.756	.259
680.0	400.0	.495	.245
680.0	480.0	.547	.154
680.0	560.0	.150	.133
680.0	640.0	.261	.280
680.0	720.0	.1000000E+32	.1000000E+32
720.0	.0	.1000000E+32	.1000000E+32
720.0	80.0	.1000000E+32	.1000000E+32
720.0	160.0	.1000000E+32	.1000000E+32
720.0	240.0	.1000000E+32	.1000000E+32
720.0	320.0	.1000000E+32	.1000000E+32
720.0	400.0	.412	.213
720.0	480.0	.400	.168
720.0	560.0	.1000000E+32	.1000000E+32
720.0	640.0	.1000000E+32	.1000000E+32
720.0	720.0	.1000000E+32	.1000000E+32
760.0	.0	.1000000E+32	.1000000E+32
760.0	80.0	.1000000E+32	.1000000E+32
760.0	160.0	.1000000E+32	.1000000E+32
760.0	240.0	.1000000E+32	.1000000E+32
760.0	320.0	.1000000E+32	.1000000E+32
760.0	400.0	.332	.181
760.0	480.0	.360	.219
760.0	560.0	.1000000E+32	.1000000E+32
760.0	640.0	.1000000E+32	.1000000E+32
760.0	720.0	.1000000E+32	.1000000E+32

Appendix M

Toxicological Profiles

Appendix M - Toxicological Profiles

Antimony
Arsenic
Benzene
Bis(2-ethylhexyl)phthalate (BEHP)
Calcium
Carbazole
Chromium
Copper
1,2-Dichloropropane
Iron
Lead
Manganese
Mercury
Nickel
Polynuclear Aromatic Hydrocarbons (PAH's)
Sodium
Thallium
Vinyl Chloride

Antimony

Antimony is found at very low levels in the environment, so low that it often cannot be measured. Antimony enters the environment during the mining and processing of its ores and in the production of antimony metal, alloys, antimony oxide, and combinations of antimony with other substances. Some antimony in the environment is less tightly attached to particles and may be taken up by plants and animals (ATSDR 1992).

The concentration of antimony in air ranges from a fraction of a nanogram in a cubic meter of air (ng/m^3) to about 170 ng/m^3(ATSDR 1992).

The concentration of antimony that is dissolved in rivers and lakes is very low, usually less than 5 parts of antimony in 1 billion parts of water (ppb). (ATSDR 1992).

Soil usually contains very low concentrations of antimony, less than 1 part of antimony in a million parts of soil (ppm). High concentrations of antimony may be found in soil due to settling of dust released during processing. Also, waste from antimony-processing and other antimony-using industries is usually dumped onto the soil (ATSDR 1992).

Exposure to antimony at high levels can result in a variety of adverse health effects. Breathing high levels for a long time can irritate your eyes and lungs and can cause heart and lung problems, stomach pain, diarrhea, vomiting, and stomach ulcers (ATSDR 1995).

Ingesting large doses of antimony can cause vomiting in humans. Other effects in humans caused by ingesting it are unknown. Long-term animal studies have reported liver damage and blood changes in animals who ingested antimony. Antimony can irritate the skin with prolonged contact (ATSDR 1995).

Exposure to 9 milligrams per cubic meter of air (mg/m^3) of antimony for a long time can irritate eyes, skin, and lungs. Breathing 2 mg/m^3 of antimony for a long time can cause lung disease (pneumoconiosis), heart problems (altered electrocardiograms), stomach pain, diarrhea, vomiting, and stomach ulcers. It is not known if antimony can cause cancer or birth defects, or affect reproduction in humans.

In short-term studies, rats and guinea pigs that inhaled very high levels of antimony died. Rats inhaling high levels of antimony for several days had lung, heart, liver, and kidney damage. In long-term studies, rats that inhaled very low levels of antimony had eye irritation, hair loss, lung damage, and heart problems. Dogs and rats that inhaled low levels of antimony for a long period had heart problems (changes in EKGs). Problems with fertility were also noted. Problems with fertility have been observed in rats that inhaled very high levels of antimony for a few months (ATSDR 1995). Lung cancer has been observed in some studies of rats inhaling high concentrations of antimony. Antimony has not been classified for cancer effects by the Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC), or the Environmental Protection Agency (EPA). (ATSDR 1992)

Antimony can have beneficial effects when used for medical reasons. It has been used to treat people infected with parasites (ATSDR 1995). Persons who have had too much antimony or are sensitive to it when it was injected into their blood or muscle and have experienced adverse health effects, including diarrhea, joint and/or muscle pain, vomiting, problems with the blood (anemia) and heart problems (altered electrocardiograms). (ATSDR 1992).

EPA has set a Maximum Contaminant Level (MCL) of 0.006 mg/L (0.006 ppm) for antimony in public drinking water supplies. EPA has found antimony to potentially cause the following health effects from acute exposures at levels above the MCL: nausea, vomiting and diarrhea. Short-term exposures in drinking water considered "safe" for a 10-kg (22 lb.) child consuming one liter of water per day: a long-term (up to 7 years) exposure to 0.01 mg/L. Antimony has the potential to cause the following health effects from long-term exposures at levels above the MCL: decreased longevity, altered blood levels of glucose and cholesterol. (OGWDW, on-line).

This substance/agent has not undergone a complete evaluation and determination under US EPA's IRIS program for evidence of human carcinogenic potential (IRIS, on-line).

The Oral RfD of 4x10-4 mg/kg-day is based on a lowest-observed-adverse-effects-level (LOAEL) of 0.35 mg/kg-day and longevity, blood glucose, and cholesterol effects in a rat chronic oral bioassay; the confidence in the oral RfD is Low. The antimony Oral RfD value was last revised on 02/01/1991. (IRIS, on-line)

No Reference Concentration for Chronic Inhalation Exposure (RfC) is available at this time. (IRIS, on-line)

References

ATSDR (Agency for Toxic Substances and Disease Registry), *Toxicological Profile for Antimony*, 1992

ATSDR ToxFAQs 1995

USEPA IRIS (Integrated Risk Information System), on-line.

USEPA OGWDW, Technical Fact Sheet on Antimony, on-line.

Arsenic

Arsenic is a naturally occurring element widely distributed in the earth's crust. In the environment, arsenic is combined with oxygen, chlorine, and sulfur to form inorganic arsenic compounds. Arsenic in animals and plants combines with carbon and hydrogen to form organic arsenic compounds. (ATSDR 2001)

Inorganic arsenic compounds are mainly used to preserve wood. Organic arsenic compounds are used as pesticides, primarily on cotton plants. (ATSDR 2001)

The concentration of arsenic in soil varies widely, generally ranging from about 1 to 40 parts of arsenic to a million parts of soil (ppm) with an average level of 5 ppm. The concentration of arsenic in natural surface and groundwater is generally about 1 part in a billion parts of water (1 ppb) but may exceed 1,000 ppb in mining areas or where arsenic levels in soil are high. Levels of arsenic in food range from about 20 to 140 ppb. People normally take in small amounts of arsenic from the air, water, and food. Levels of arsenic in the air generally range from less than 1 to about 2,000 nanograms (1 nanogram equals a billionth of a gram) of arsenic per cubic meter of air (less than1–2,000 ng/m3). The level of inorganic arsenic (the form of most concern) taken in from these sources is generally about 3.5 µg/day. (ATSDR 2000)

Organic arsenic compounds are less toxic than inorganic arsenic compounds. Exposure to high levels of some organic arsenic compounds may cause similar effects as inorganic arsenic. (ATSDR 2001)

Large oral doses (above 60,000 ppb in food or water) can produce death. Ingestion of lower levels of inorganic arsenic (ranging from about 300 to 30,000 ppb in food or water) could produce irritation of the stomach and intestines, with symptoms such as stomach ache, nausea, vomiting, and diarrhea. Other effects of ingested inorganic arsenic include decreased production of red and white blood cells which may cause fatigue, abnormal heart rhythm, blood-vessel damage resulting in bruising, and impaired nerve function causing a "pins and needles" sensation in the hands and feet. (ATSDR 2000)

Ingesting or breathing low levels of inorganic arsenic for a long time can cause a darkening of the skin and the appearance of small "corns" or "warts" on the palms, soles, and torso. Skin contact with inorganic arsenic may cause redness and swelling. (ATSDR 2001)

Several studies have shown that inorganic arsenic can increase the risk of lung cancer, skin cancer, bladder cancer, liver cancer, kidney cancer, and prostate cancer. The World Health Organization (WHO), the Department of Health and Human Services (DHHS), and the EPA have determined that inorganic arsenic is a human carcinogen. (ATSDR 2001)

EPA has set limits on the amount of arsenic that industrial sources can release to the environment and has restricted or canceled many uses of arsenic in pesticides.

EPA initially set a Maximum Contaminant Level (MCL) of 0.05 parts per million (0.05 ppm or 50 ppb) for arsenic in public drinking water supplies. As required by the Clean Water Act, EPA reexamined and revised the arsenic drinking water standard to 0.01 ppm (10 ppb); the EPA final rule for arsenic in drinking water, was published on January 22, 2001 in the Federal Register. (FR, 2001) On February 22, 2002 the revised arsenic in drinking water rule became effective; the date by which systems must comply with the new 10 ppb standard is January 23, 2006. (OGWDW, on-line)

The Occupational Safety and Health Administration has set a worker permissible exposure limit (PEL) of 10 micrograms arsenic per cubic meter of workplace air (10 $\mu g/m^3$) for an 8 hour shift of a 40 hour work week. (NIOSH, June 1997)

Arsenic has been classified as a Category A (Human Carcinogen) based on sufficient evidence from human data. An increased lung cancer mortality was observed in multiple human populations exposed primarily through inhalation. Also, increased mortality from multiple internal organ cancers (liver, kidney, lung, and bladder) and an increased incidence of skin cancer were observed in populations consuming drinking water high in inorganic arsenic. The cancer toxicity values were last revised on 04/10/1998. (IRIS, on-line)

The Oral Slope Factor is 1.5 per mg/kg-day, based on skin cancer in humans exposed through ingestion of drinking water. (IRIS, on-line)

The Drinking Water Unit Risk is $5x10^{-2}$ per mg/L. (IRIS, on-line)

The Inhalation Unit Risk is 4.3E-3 per (ug/m3), based on lung cancer in human males occupationally exposed. (IRIS, on-line)

The Reference Dose for Chronic Oral Exposure (RfD) of $3x10^{-4}$ mg/kg-day is based on a no-observed-adverse-effects level (NOAEL) of 0.009 mg/L converted to 0.0008 mg/kg-day and hyperpigmentation, keratosis and possible vascular complications with human chronic oral exposure; the confidence in the oral RfD is Medium. A screening-level review conducted by an EPA contractor of the more recent toxicology literature pertinent to the RfD for Arsenic (inorganic) in September 2002 identified one or more significant new studies. The Oral RfD was last revised on 02/01/1993. (IRIS, on-line)

No Reference Concentration for Chronic Inhalation Exposure (RfC) is available at this time. (IRIS, on-line)

The ATSDR Minimal Risk Level for acute, oral ingestion exposure is 0.005 mg/kg/day to prevent gastrointestinal problems. (ATSDR, 2002)

References

ATSDR (Agency for Toxic Substances and Disease Registry), *Toxicological Profile for Arsenic*, 2000.

ATSDR (Agency for Toxic Substances and Disease Registry), ToxFAQs, 2001.

ATSDR (Agency for Toxic Substances and Disease Registry), Minimal Risk Levels (MRLs) for Hazardous Substances, 2002, on-line.
Federal Register, 66 FR 6976, January 22, 2001.
I
RIS (EPA Integrated Risk Information System), on-line.

NIOSH (National Institute for Occupational Safety and Health), *Pocket Guide to Chemical Hazards*, June 1997.

OGWDW (EPA Office of Ground Water and Drinking Water), http://www.epa.gov/OGWDW/ arsenic. html

Bis(2-ethylhexyl)phthalate (BEHP)

BEHP is a manufactured chemical that is commonly added to plastics to make them flexible. Other names for this compound are dioctyl phthalate (DOP) and di(2-ethylhexyl) phthalate (DEHP). (Note that di-n-octyl phthalate, however, is a different chemical.). BEHP is a colorless liquid with almost no odor. It does not evaporate easily, and little will be present in the air even near sources of production. It dissolves more easily in materials such as gasoline, paint removers, and oils than it does in water. It is present in many plastics, especially vinyl materials, which may contain up to 40% DEHP, although lower levels are common.

BEHP enters the body during ingestion of food or water containing this material or inhalation of contaminated air. Small amounts of BEHP might enter the body by skin contact with plastics, but scientists are fairly certain that very little enters this way. Most BEHP that enters the body in food, water, or air is taken up into the blood from the gastrointestinal tract and lungs. BEHP can be introduced directly into the bloodstream during a blood transfusion, receiving medicines through flexible plastic tubing, or having dialysis treatments.

After BEHP is ingested, most of it is rapidly broken down in the gut to MEHP and 2-ethylhexanol. Breakdown is much slower if BEHP enters the blood directly by way of a transfusion. Although some MEHP is absorbed into the bloodstream from the gut, MEHP is poorly absorbed, so that much of ingested BEHP leaves the body in the feces. The compounds that do enter the blood travel through the bloodstream to the liver, kidneys, testes, and other tissues, and small amounts might become stored in fat tissues and could possibly be secreted in breast milk. Most of the BEHP, MEHP, and 2-ethylhexanol leaves the body within 24 hours in the urine and feces.

At the levels found in the environment, BEHP is not expected to cause harmful health effects in humans. Most of what we know about the health effects of BEHP comes from studies of rats and mice given high amounts of BEHP. Harmful effects in animals generally occurred only with high amounts of BEHP or with prolonged exposures. The absorption and breakdown of BEHP in humans is different than in rats or mice, so the effects seen in rats and mice may not occur in humans.

Rats that breathed BEHP in the air showed no serious harmful effects. Their lifespan and ability to reproduce were not affected. Brief oral exposure to very high levels of BEHP damaged sperm in mice. Although the effect reversed when exposure ceased, sexual maturity was delayed in the animals. High amounts of BEHP damaged the liver of rats and mice. Whether or not BEHP contributes to human kidney damage is unclear.

Skin contact with products containing BEHP will probably cause no harmful effects because it cannot be taken up easily through the skin.

EPA has set a Maximum Contaminant Level (MCL) for the amount of BEHP that may be present in public drinking water supplies at 6 parts of BEHP per billion parts of water (6 ppb or 6 μg/L), to protect against damage to the liver and testes, reproductive effects, and an increased risk of cancer. (OGWDW, on-line) EPA requires that spills of 100 pounds or more of BEHP to the environment be reported to the agency.

The Department of Health and Human Services (DHHS) has determined that BEHP may reasonably be anticipated to be a human carcinogen. The International Agency for Research on Cancer (IARC) has stated that BEHP cannot be classified as to its carcinogenicity to humans. The EPA has determined that BEHP is a probable human carcinogen (B2), based on significant dose-related increases in liver tumors with orally administered DEHP in multiple animal studies (rats and mice of both sexes). The cancer assessment was last revised on 02/01/1993. (IRIS, on-line)

The Oral Slope Factor of 1.4×10^{-2} mg/kg/day is based on evidence of hepatocellular carcinoma and adenoma in male mice administered BEHP in their diet. (IRIS, on-line)
The Drinking Water Unit Risk is 4.0×10^{-7} per µg/L. (IRIS, on-line)

No Inhalation Unit Risk is available at this time. (IRIS, on-line)

A Reference Dose for Chronic Oral Exposure (RfD) of 2x10-2 mg/kg-day was developed from the lowest-observed-adverse-effects-level (LOAEL) of 19 mg/kg-day, based on increased relative liver weight in a guinea pig subchronic to chronic oral bioassay; the confidence in the RfD is medium. The RfD was last revised on 05/01/1991. (IRIS, on-line)

The Reference Concentration for Chronic Inhalation Exposure (RfC) was not assessed. (IRIS, on-line)

A provisional ATSDR Minimal Risk Level (MRL) for intermediate oral exposure of 0.1 mg/kg/day was developed to protect against developmental effects. (ATSDR, 2002)

References

ATSDR (Agency for Toxic Substances and Disease Registry), *Toxicological Profile on Di (2-ethylhexyl)Phthalate*, 2002

ATSDR (Agency for Toxic Substances and Disease Registry), ToxFAQs, 2002

ATSDR (Agency for Toxic Substances and Disease Registry), Minimal Risk Levels (MRLs) for Hazardous Substances, 2002, on-line.

IRIS (EPA Integrated Risk Information System), on-line.

OGWDW (EPA Office of Ground Water and Drinking Water), on-line at www.epa.gov/safewater/hfacts.html

Benzene

Benzene is a colorless liquid with a sweet odor. It is volatile, slightly soluble in water, and flammable. Benzene occurs naturally and is also produced by man. It is used in production of chemicals, and in the manufacturing of some types of rubbers, lubricants, dyes, detergents, drugs and pesticides. Industrial processes are the main source of benzene in the environment. Benzene in water and soil may evaporate into the air where it is degraded in a few days. Benzene biodegrades under aerobic conditions, but a portion of benzene is expected to be lost due to volatilization (ATSDR, 1997).

Most people are exposed to a small amount of benzene on a daily basis. The major sources of benzene exposure are gasoline, automobile exhaust, industrial emissions, and tobacco smoke. Brief exposure to very high levels of benzene in air can result in death. Exposure to lower levels may cause drowsiness, dizziness, headaches, and unconsciousness. These effects usually disappear once exposure is interrupted. Ingestion of foods or beverages containing high levels of benzene may result in vomiting, dizziness, convulsions, and death. Human health effects associated with ingestion of lower levels of benzene are currently unknown. Dermal contact with benzene may cause redness or blisters (ATSDR, 1997).

The majority of information on the effects of long-term exposure to benzene is from studies involving occupational exposure of employees to ambient levels of benzene much greater than the levels normally encountered by the general population. Inhalation of benzene for long periods of time may cause adverse effects in the tissues that form blood cells, especially the bone marrow. This may result in disruption of normal blood production and cause a decrease in important blood components, leading to anemia or excessive bleeding. Blood production may return to normal upon disruption of exposure. Benzene exposure can be harmful to the immune system, enhancing the probability of infection and perhaps lowering the body's defense against tumors. Long-term exposure to benzene in the air causes leukemia and has been associated with genetic changes (ASTDR, 1997).

Long-term exposure to benzene may also damage the reproductive organs. Some female workers who breathed high levels of benzene for many months experienced irregular menstrual cycles. Examination of these women revealed a decrease in ovary size. However, exposure levels were not documented, and it was not proven that benzene was responsible for the effects. Currently it is not known what effects benzene exposure has on the developing fetus in pregnant women. Studies in which pregnant laboratory animals were exposed to benzene resulted in low birth weights, delayed bone formation, and bone marrow damage (ATSDR, 1997).

EPA set a Maximum Contaminant Limit (MCL) of 0.005 parts per million (0.005 mg/L or 5 μ/L) for benzene in public drinking water supplies, based on a potential for anemia, decreases in blood platelets, and increased risk of cancer with ingestion of drinking water containing benzene above the MCL. (OGWDW, on-line)

The Occupational Health and Safety Administration has set a worker permissible exposure limit (PEL) of 1 ppm benzene in workplace air for an 8 hour shift of a 40 hour work week. (NIOSH, 1997)

Benzene is classified as a Group A carcinogen ("known" Human Carcinogen) for all routes of exposure based upon convincing human evidence as well as supporting evidence from animal studies. Epidemiologic studies and case studies provide clear evidence of a causal association between exposure to benzene and acute nonlymphocytic leukemia (ANLL) and also suggest evidence for chronic nonlymphocytic leukemia (CNLL) and chronic lymphocytic leukemia (CLL). Other neoplastic conditions that are associated with an increased risk in humans are hematologic neoplasms, blood disorders such as preleukemia and aplastic anemia, Hodgkin's lymphoma, and myelodysplastic syndrome (MDS). These human data are supported by animal studies. The experimental animal data add to the argument that exposure to benzene increases the risk of cancer in multiple species at multiple organ sites (hematopoietic, oral and nasal, liver, fore-stomach, preputial gland, lung, ovary, and mammary gland). It is likely that these responses are due to interactions of the metabolites of benzene with DNA. The cancer toxicity values were last revised on 1/19/2000. (IRIS, on-line)

The Oral Slope Factor range of 1.5×10^{-2} - 5.5×10^{-2} per mg/kg-day is based on leukemia in humans and is extrapolated from occupational inhalation exposure. (IRIS, on-line)
The Drinking Water Unit Risk range is 4.4×10^{-4} - 1.6×10^{-3} per mg/L. (IRIS, on-line)
The Air Unit Risk range of 2.2×10^{-3} - 7.8×10^{-3} per mg/m^3 is based on leukemia in humans with occupational inhalation exposure. (IRIS, on-line)

The EPA NCEA Superfund Technical Support Center (STSC) has developed a provisional Reference Dose for Chronic Oral Exposure (RfD) of 1×10^{-3} mg/kg-day for noncarcinogenic effects from oral exposure to benzene. (NCEA,1998)
The EPA NCEA Superfund Technical Support Center (STSC) has developed a provisional Reference Concentration for Chronic Inhalation Exposure (RfC) of 9×10^{-3} mg/m^3 for noncarcinogenic effects from inhalation exposure to benzene. (NCEA, 1998)

The ATSDR Minimum Risk Level (for acute inhalation) is 0.05 ppm to protect against immunological effects. (ATSDR, 2002).

References:

ATSDR (Agency for Toxic Substances and Disease Registry), *Toxicological Profile for Benzene*. 1997.

ATSDR (Agency for Toxic Substances and Disease Registry), ToxFAQs, 1997.

ATSDR (Agency for Toxic Substances and Disease Registry), Minimal Risk Levels (MRLs) for Hazardous Substances, 2002, on-line.

IRIS (EPA Integrated Risk Information System), on-line.

NCEA (EPA National Center for Environmental Assessment, Superfund Technical Support Center), Toxicological Review of Benzene (Noncancer Effects), Draft, NCEA-S-0455, September 1998.

OGWDW (EPA Office of Ground Water and Drinking Water, on-line at http://www.epa.gov/safewater/mcl.html

NIOSH (National Institute for Occupational Safety and Health), *Pocket Guide to Chemical Hazards*, June 1997.

Calcium

Calcium is an essential nutrient, and is necessary for building bones and teeth and in maintaining bone strength. Calcium is also used in muscle contraction, blood clotting, and maintenance of cell membranes. The National Academy of Sciences (NAS) Institute of Medicine has established an upper intake level (ULs) for calcium of 2,500 mg per day for all age groups over 1 year of age and for pregnant and lactating females.(NAS, 1999) For infants, ULs were not determined for calcium because of the lack of data on adverse effects in this age group and concern regarding infant's possible lack of ability to handle excess amounts. The NAS indicates that caution is warranted, and food should be the source of intake by infants. The UL critical adverse effect for infants ingesting excess calcium is milk-alkali syndrome. (NAS, 1999).

Although no adverse effects have been observed in many healthy adults consuming up to 2,500 mg of calcium per day, high intakes may induce constipation and place up to half of otherwise healthy hypercalciuric males at increased risk of urinary stone formation (NRC, 1989). A high calcium intake may inhibit the intestinal absorption of iron, zinc, and other essential minerals (NRC, 1989). Ingestion of very large amounts may result in hypercalciuria, hypercalcemia, and deterioration in renal function in both sexes (NRC, 1989).

According to the Joint National Committee's report, evidence suggests that calcium may play a role in reducing the risk of high blood pressure. For this reason, nutrition experts often encourage people with hypertension to increase their intakes of calcium. (FDA, 1993). Clinical findings have demonstrated a mild, short-term reduction in blood pressure from calcium supplementation in some patients with normal and elevated blood pressure. However, in certain patients with hypertension and high levels of renin, blood pressure may increase. (NAS, 1989)

References

FDA (U.S. Food and Drug Administration), *Fifth Report of the Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure*, January 1993.

NRC (National Research Council), *Recommended Dietary Allowances, 10th Edition* (1989).

NAS (National Academy of Sciences), *Dietary Reference Intakes: A Risk Assessment Model for Establishing Upper Intake Levels for Nutrients* (1999).

NAS (National Academy of Sciences), Commission on Life Sciences, *Diet and Health: Implications for Reducing Chronic Disease Risk* (1989).

Carbazole

Carbazole, also known as 9-azafluorene and dibenzopyrrole, is a coal conversion by-product. (MSDS, 2001) Very little data exists on this compound.

Carbazole is harmful by inhalation or ingestion, and may be harmful in contact with skin. It is a suspected carcinogen. (MSDS, 2001) According to IARC, carbazole is, not classifiable as to its carcinogenicity to humans (Group 3) (OSHA Chemical Sampling Information, on-line). However, in May 2002, California's Office of Environmental Health Hazard Assessment included carbazole in their "List of Chemicals Known to the State of California to Cause Cancer or Reproductive Toxicity". Carbazole is harmful by inhalation or ingestion and may be harmful in contact with skin (Physical & Theoretical Chemistry Lab Safety, 2001).

There is limited evidence that suggests carbazole is carcinogenic in rats at an oral dose of 504 mg/kg over a six week period (NTP, 2001). In rats and rabbits, the compound is metabolized to 3-hydroxycarbazole.

Carbazole has not undergone a complete evaluation and determination under US EPA's IRIS program for evidence of human carcinogenic potential. (IRIS, on-line)

The EPA Health Effects Assessment Summary Tables (HEAST) provide a cancer classification of B2 (probable human carcinogen) and an Oral Slope Factor of 2×10^{-2} per mg/kg/day, based on liver tumors in mice fed carbazole in their diet. (HEAST, 1997)

The Drinking Water Unit Risk is 5.7×10^{-7} per µg/L. (HEAST, 1997)

References

HEAST (EPA Health Effects Assessment Summary Tables), FY1997 Update, EPA-540-R-97-036, July 1997.

IRIS (EPA Integrated Risk Information System), on-line.

NTS (National Toxicity Program), NTP Chemical Repository B Carbazole, 2001

OEHHA (Office Environmental Health Hazard Assessment), List of Chemicals Known to the State of California to Cause Cancer or Reproductive Toxicity, 2002

MSDS (Physical & Theoretical Chemistry Lab Safety), Oxford University, Material Safety Data Sheets, 2001

Chromium

Chromium (Cr) is a naturally occurring element found in rocks, animals, plants, soil, and in volcanic dust and gases. Chromium is present in the environment in several different forms. The most common forms are chromium (0), chromium (III), and chromium (VI). Chromium (III) occurs naturally in the environment and is an essential nutrient. Chromium (VI) and chromium (0) are generally produced by industrial processes. (ATSDR 2001)

In air, chromium compounds are present mostly as fine dust particles. This dust eventually settles over land and water. Rain and snow help remove chromium from air. Chromium compounds will usually remain in the air for fewer than 10 days. Although most of thechromium in water binds to soil and other materials and settles to the bottom, a small amount may dissolve in the water. Fish do not accumulate much chromium in their bodies from water. Most of the chromium in soil does not dissolve easily in water and can attach strongly to the soil. A very small amount of the chromium in soil, however, will dissolve in water and can move deeper in the soil to groundwater. The movement of chromium in soil depends on the type and condition of the soil and other environmental factors. (ATSDR 2000)

The level of chromium in air and water is generally low. The concentration of total chromium in air (both chromium (III) and chromium(VI)) generally ranges between 0.01 and 0.03 microgram (μg) (1 μg equals 1/1,000,000 of a gram) per cubic meter of air ($\mu g/m^3$). Chromium concentrations in drinking water (mostly as chromium (III)) are generally very low, less than 2 parts of chromium in a billion parts of water (2 ppb).

Chromium (III) is an essential nutrient that helps the body use sugar, protein, and fat. An intake of 50–200 μg of chromium(III) per day is recommended for adults. Chromium (III) occurs naturally in many fresh vegetables, fruits, meat, yeast, and grains (cereals). On the average, adults in the United States take in an estimated 60–80 μg of chromium per day in food. Therefore, many people's diets may not provide enough chromium (III). Without chromium (III) in the diet, the body loses its ability to use sugars, proteins, and fat properly, which may result in weight loss or decreased growth, improper function of the nervous system, and a diabetic-like condition. Therefore, chromium (III) compounds have been used as dietary supplements and are beneficial if taken in recommended dosages. (ATSDR 2000) Few serious side effects have been associated with excess intake of chromium from food. (NAS, 2002) Ingesting large amounts of chromium (VI) can cause stomach upsets and ulcers, convulsions, kidney and liver damage, and even death. (ATSDR 2001)

The National Academies of Science has recently revised the recommendations on chromium intake. There is evidence that chromium enhances the action of insulin, providing a beneficial effect on circulating glucose and insulin levels in individuals with diabetes. However, there is insufficient dose-response data to establish a Recommended Dietary Allowance (RDA). Based on estimates of chromium from nutritionally adequate diets, the NAS recommends an adequate intake (AI) of 35 and 25 micrograms per day for men and women, respectively. Little data is available on adverse effects resulting from chronic intake of the high levels of the chromium contained in supplements, and no upper intake level (UL) for chromium has been established. (NAS, 2002)

Accidental or intentional swallowing of large amounts of chromium has caused stomach upsets and ulcers, convulsions, kidney and liver damage, and even death. The levels of chromium (VI) that caused these effects were far greater than those normally present in food or water. Although chromium (III) in small amounts is a nutrient needed by the body, swallowing large amounts of chromium (III) may cause health problems. Workers handling liquids or solids that contain chromium (VI) have developed skin ulcers. Some have been found to be extremely sensitive to chromium (VI) or chromium (III). Allergic reactions consisting of severe redness and swelling of the skin have been noted. Exposure to chromium (III) is less likely than exposure to chromium (VI) to cause skin rashes in chromium-sensitive people. The metal, chromium (0), is less common and does not occur naturally; chromium (0) is not currently believed to cause a serious health risk. There is no reliable information that any form of chromium has harmful effects on reproduction or causes birth defects in humans, though it does not seem likely that the amount of chromium that most people are exposed to will result in reproductive or developmental effects. (ATSDR 2000)

Breathing in high levels (greater than 2 $\mu g/m^3$) of chromium (VI), such as in chromic acid or chromium (VI) trioxide aerosols, can cause irritation to the nose, such as runny nose, sneezing, itching, nosebleeds, ulcers, and holes in the nasal septum. These effects have primarily occurred in factory workers who make or use chromium (VI) for several months to many years. Several studies have shown that chromium (VI) compounds can increase the risk of lung cancer. Long-term exposure to chromium has been associated with lung cancer in workers exposed to chromium aerosols at levels in air that were 100 to 1,000 times higher than those found in the natural environment. Lung cancer may occur long after exposure to chromium has ended. Chromium (VI) is believed to be primarily responsible for the increased lung cancer rates observed in workers who were exposed to high levels of chromium in workroom air. Animal studies have also shown an increased risk of cancer. Breathing in small amounts of chromium (VI) for short periods does not cause a problem in most people. However, high (acute) levels of chromium in the workplace have caused asthma attacks in people who are allergic to chromium. Breathing in chromium (III) does not cause irritation to the nose or mouth in most people Animal studies have also shown an increased risk of cancer. (ATSDR, 2000)

The World Health Organization (WHO) has determined that chromium (VI) is a human carcinogen. Because some chromium (VI) compounds have been associated with lung cancer in workers and caused cancer in animals, the Department of Health and Human Services (DHHS) has determined that certain chromium (VI) compounds (calcium chromate, chromium trioxide, lead chromate, strontium chromate, and zinc chromate) are known human carcinogens. The International Agency for Research on Cancer (IARC) has determined that chromium (VI) is carcinogenic to humans, based on sufficient evidence in humans for the carcinogenicity of chromium (VI) compounds as found in chromate production, chromate pigment production, and chromium plating industries. The EPA has determined that chromium (VI) in air is a human carcinogen. The EPA has also determined that there is insufficient information to determine whether chromium (VI) in water or food and chromium (III) are human carcinogens. (ATSDR 2000)

EPA set a Maximum Contaminant Limit (MCL) of 0.1 parts per million (0.1 mg/L) for chromium in public drinking water supplies, based on the potential for damage to the liver, kidney circulatory and nerve tissues and for skin irritation with lifetime ingestion of drinking water containing chromium above the MCL. (OGWDW, on-line)

The Occupational Safety and Health Administration (OSHA) has set exposure limits of 0.5 mg/m^3 for water soluble chromium(III) compounds, 1 mg/m ^{3} for metallic chromium (0) and insoluble chromium compounds in air for an 8-hour work shift and 40-hour work week. NIOSH has set an exposure limit of 0.001 mg/m ^{3} for carcinogenic chromium(VI) compounds in workplace air. (NIOSH, 1997)

Chromium VI has been classified as a Category A (known Human Carcinogen) by the inhalation route of exposure based on occupational epidemiologic studies of chromium-exposed workers. Dose-response relationships have been established for chromium exposure and lung cancer. These workers were exposed to both Cr(III) and CR(VI) compounds. However, because only Cr(VI) has been found to be carcinogenic in animal studies, it was concluded that only Cr(VI) should be classified as a carcinogen. Carcinogenicity by the oral route of exposure cannot be determined and is classified as Group D. The cancer toxicity values were last revised on 09/03/1998. (IRIS, on-line)

The Air Unit Risk for Cr (VI) is 1.2×10^{-2} per $\mu g/m^3$, and is based on lung cancer in workers exposed through inhalation. (IRIS, on-line)

The Reference Dose for Chronic Oral Exposure (RfD) to Cr (VI) of 3×10^{-3} mg/kg-day is based on a no-observed-adverse-effects level (NOAEL) of 25 mg/L as K_2CrO_4 (2.5 mg/kg-day) in a 1-year rat study in which hexavalent and trivalent chromium were administered in drinking water. This RfD applies only to soluble salts of hexavalent chromium. There is evidence that hexavalent chromium is reduced in part to trivalent chromium in vivo. A Reference Dose for Chronic Oral Exposure (RfD) to Cr (III) of 1.5 mg/kg-day has also been developed, based on a no-observed-adverse-effects level (NOAEL) (ADJ) of 1468 mg/L (as K_2CrO_4) in a separate rat chronic feeding study. The confidence in both RfD's is Low. The Oral RfDs were last revised on 09/03/1998. (IRIS, on-line)

The Reference Concentration for Chronic Inhalation Exposure (RfC) for Cr(VI) particulates of 1×10^{-4} mg/m^3 is based on a benchmark dose (BMD) of 0.016 mg/m^3 and increases in lactate dehydrogenase (LDH) in bronchioalveolar lavage fluid (BALF) in a rat subchronic study. Two high quality rat studies provide useful information on Cr(VI) particulate exposure, including lung and spleem weight, LDH in BALF and albumin in BALF. The cellular content of the BALF is considered representative of initial pulmonary injury and chronic lung inflammation, which may lead to the onset of pulmonary fibrosis. The confidence in the RfC is Medium. Information on Cr(III) exposure was reviewed, but a RfC for for Cr (III) was not estimated. The Inhalation RfC was last revised on 09/03/1998. (IRIS, on-line)

The ATSDR Minimal Risk Level (MRL) for inhalation of chromium VI particulate exposure is 0.001 mg/m^3 to prevent respiratory effects. (ATSDR, 2002)

References

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NIOSH (National Institute for Occupational Safety and Health), *Pocket Guide to Chemical Hazards*, June 1997.

OGWDW (EPA Office of Ground Water & Drinking Water), on-line at http://www.epa.gov/safewater/hfacts.html

Copper

Copper is an important reddish metal that occurs naturally in rock, soil, water, sediment and air where it is an essential element. In its pure form, copper is used as the primary metal or an alloy in the manufacture of wire, sheet metal, water pipes, etc. Copper is also combined with other elements to form copper compounds. Copper sulfate, the most common copper salt, is used as a fungicide on citrus, peanuts, potatoes, and other vegetable crops, for water treatment and, as preservatives for wood, leather and fabrics (ATSDR, on-line).

Copper is an essential nutrient and is needed for proper development of connective tissues, nerve coverings and skin pigment. (NAS, 2002) Copper is essential for good health, but high amounts can be harmful. Exposure to copper can occur by breathing air, drinking water, eating food and by skin contact with copper-containing compounds. Long-term exposure to copper dust can irritate the nose, mouth, and eyes, and cause headaches, dizziness, nausea, and diarrhea. Acute exposure to copper can cause liver and kidney damage and even death (ATSDR, on-line).

Experimental studies in humans suggest that ingestion of drinking water with greater than 3 milligrams per liter-copper will produce gastrointestinal symptoms including nausea, vomiting, and diarrhea. The available human and animal acute-duration studies strongly suggest that the gastrointestinal tract is the most sensitive target of copper toxicity. Ingestion of large amounts of copper salts, most frequently copper sulfate, may produce hepatic necrosis and death (Klaassen, 2001).

The National Academies of Science (NAS) has recently set a new Recommended Dietary Allowance (RDA) for copper at 900 micrograms/day (0.9 mg/day) for both men and women. To protect against possible liver damage, the upper intake limit (UL) was set at 10 milligrams per day. There is no known benefit of comsuming copper in excess of the RDA. Copper is widely distributed in foods such as organ meats, seafood, nuts, and seeds; some foods that are consumed in substantial amounts, such as milk, tea, chicken, and potatoes, also contain the nutrient, but at lower levels. (NAS, 2002) An RDA of 340 micrograms/day - 900 micrograms/day is appropriate for children from 1 year of age up to adults, respectively (ATSDR, on-line).

EPA has set an Action Level of 1.3 mg/L (0.006 ppm) for copper in 10 percent or more of tap water samples in a public drinking water supply, based on evidence that copper can potentially cause stomach and intestinal distress, liver and kidney damage, and anemia at high doses. Persons with Wilson's disease may be at a higher risk of health effects due to copper than the general public. The primary source of copper in drinking water is corrosion of copper pipes, which are widely used throughout the United States for interior plumbing of residences and other buildings. In some cases, copper is a component of additives to drinking water used by systems to control the growth of algae. (OGWDW, on-line).

Copper is classified as a Class D carcinogen (non-classifiable as to carcinogenicity). The IRIS file was last revised on 08/01/1991. (IRIS, on-line).

The EPA NCEA Superfund Technical Support Center developed a provisional oral RfD for chronic oral exposure of 4 x10-2 mg/kg-day. (NCEA, 1992)

ATSDR has recently developed a Minimum Risk Level (MRL) of 0.02 mg/kg/day for acute-duration, oral exposure to copper (1-14 days). (ATSDR, on-line).

References:

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1,2-Dichloropropane

1,2-Dichloropropane is a colorless liquid belonging to a class of chemicals called volatile organic compounds (VOC's). It has a chloroform-like odor and evaporates quickly at room temperature. It is a man-made chemical and people are probably responsible for all releases of 1,2- dichloropropane into the environment. 1,2-Dichloropropane is now used in the United States only in research and industry. Before the early 1980s, 1,2-dichloropropane was used in farming as a soil fumigant and was found in some paint strippers, varnishes, and furniture finish removers. Most of the 1,2-dichloropropane released into the environment ends up in the air or groundwater. When applied to soil in one experiment, all but 1% dispersed in 10 days. Breakdown in both the air and groundwater is slow (ATSDR 1989).

In city areas, the average amount in air is about 22 parts per trillion (ppt). 1,2-Dichloropropane is found in a few drinking water supplies, and most of those are from groundwater sources. Private wells in farming areas where 1,2-dichloropropane was once used as a soil fumigant have the greatest risk for contamination. Workers involved in cleaning up hazardous waste or spill sites that contain 1,2-dichloropropane may also be exposed (ATSDR 1989).

Experiments with animals have shown that when 1,2-dichloropropane enters the body through ingestion, it is quickly removed in the urine and feces and by the lungs when the animal breathes out. 1,2-Dichloropropane may enter the lungs of workers exposed where it is used indoors as a solvent. If 1,2-dichloropropane is released at a waste site and evaporates into the air, a person may breathe in 1,2-dichloropropane for a short time before it disperses. When the chemical was a part of some paint strippers, varnishes, and furniture finish removers, exposure of the skin through contact with these products occurred; however, the amount of 1,2-dichloropropane that entered through the skin is unknown. Soil around a waste site may be contaminated with 1,2-dichloropropane, but it is not known how much 1,2-dichloropropane enters the body through the skin upon contact with contaminated soil (ATSDR 1989).

Direct ingestion 1,2-dichloropropane by humans (i.e., drinking cleaning solutions) has produced poisoning. At these high levels of exposure, effects include dizziness, headache, nausea, injury to the liver and kidneys, anemia, coma and, ultimately, death. Breathing high levels of 1,2-dichloropropane by humans, as in deliberate breathing of vapors from cleaning solutions, produces similar effects. No reports have been made of any health effects in humans following low-level exposure to 1,2-dichloropropane for either short or long time periods (ATSDR 1989).

Animal studies indicate that breathing low levels of 1,2-dichloropropane over short- or long-term periods causes damage to the liver, kidney, and respiratory system. Breathing high levels causes death. Similar effects have been reported when animals were given 1,2-dichloropropane by mouth. Some studies indicate that ingesting 1,2-dichloropropane may cause reproductive effects. One study reported a delay in bone formation of the skull in fetal rats following exposure of the mother rats to 1,2-dichloropropane. (ATSDR 1999)

It is not known whether 1,2-dichloropropane causes cancer in humans. The carcinogenicity of 1,2-dichloropropane has been evaluated in animal studies with rats and mice. Liver tumors havebeen observed in mice, and mammary gland tumors have been found in rats. The International Agency for Research on Cancer (IARC) has determined that 1,2-dichloropropane is unclassifiable as to human carcinogenicity (ATSDR 1999).

The EPA has set a Maximum Contaminant Level (MCL) of 0.005 parts per million (0.005 ppm or 0.005 mg/L)) for 1,2-dichloropropane in public drinking water supplies, based on a potential for an increased risk of cancer. (OGWDW, on-line) The EPA recommends that the level of 1,2-dichloropropane in lakes and streams be limited to 0.52 parts per billion (0.52 ppb) to prevent possible human health effects from drinking contaminated water or eating contaminated fish. Any release to the environment greater than 1,000 pounds of 1,2-dichloropropane must be reported to the EPA (ATSDR 1999).

The Occupational Safety and Health Administration (OSHA) has set a worker permissible exposure limit (PEL) of 75 ppm in workplace air for an 8 hour shift of a 40 hour work week. (NIOSH, 1997) The amount at which the odor of 1,2-dichloropropane is first noticed is 0.25 ppm; therefore, most people would probably smell 1,2-dichloropropane before it reached a harmful level. Continued exposure to the odor may reduce the ability to smell 1,2-dichloropropane at 0.25 ppm (ATSDR 1989).

1,2-Dichloropropane has not undergone a complete evaluation and determination under US EPA's IRIS program for evidence of human carcinogenic potential. (IRIS, on-line) The EPA Health Effects Assessment Summary Tables (HEAST) provide a cancer classification of B2 (probable human carcinogen) and an Oral Slope Factor of 6.8×10^{-2} per mg/kg/day, based on liver tumors in mice administered 1,2-dichloropropane by gavage. (HEAST, 1997)
The Drinking Water Unit Risk is 1.9×10^{-6} per µg/L. (HEAST, 1997)

The Reference Dose for Chronic Inhalation Exposure (RfC) is 4×10^{-3} mg/m^3, based on hyperplasia of the nasal mucosa in a 13-week rat inhalation study; the confidence in the RfC is medium. The RfC was last revised on 12/01/1991. (IRIS, on-line)

The ATSDR Minimal Risk Level: (for acute inhalation exposure) is 0.5 ppm to protect against respiratory effects. (ATSDR, 1989)

References

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Iron

Iron is an essential element and therefore a necessary part of the human diet. Iron is vital for transporting oxygen in the bloodstream and for the prevention of anemia. Even more of the nutrient is needed during periods of growth and for the fetus during pregnancy. Women during pre-menopause years also need more, since iron is lost through menstruation. The toxicity of iron must be considered, however, since accidental acute exposures and chronic iron overload can occur.

Acute iron toxicity is usually due to accidental ingestion by children of medications containing iron. Severe toxicity occurs after ingestion of more than 0.5 g of iron or 2.5 g of ferrous sulfate. Vomiting may occur one to six hours after ingestion, and may be bloody due to ulceration of the gastrointestinal tract. Black stools may also occur. Vomiting may be followed by signs of shock and metabolic acidosis, liver damage, and coagulation defects within a few days of actue iron ingestion. Renal failure and hepatic cirrhosis may be seen as late effects of toxicity (Klaassen, 2001).

Chronic iron toxicity or iron overload in adults is a more common problem than accidental, acute exposure resulting in iron toxicity in children. Excessive amounts of iron may accumulate in the body in three ways. Abnormal absorption of iron from the intestinal tract may occur due to a genetic anomaly. An excess dietary intake of iron and a regular requirement for blood transfusions may also create an iron overload. With iron overload, iron stores are increased in the parenchymal cells of the liver and pancreas, the endocrine organs, and heart. The clinical effects of iron overload may include disturbances of liver function, diabetes mellitus, endocrine disturbances, and cardiovascular effects (Klaassen, 2001).

In 1989, the Food and Nutrition Board of the National Research Council recommended the following Recommended Dietary Allowance (RDA) for iron based on gender and age: 15 mg/day for healthy adolescent and adult women; 10mg/day for adult men and postmenopausal women; and 15 mg/day for pregnant women (NRC, 1989).

The new report of the National Academies of Sciences (NAS) sets the RDA for iron for men and post-menopausal women at 8 milligrams per day, and at 18 milligrams for pre-menopausal women. Pregnant women should consume 27 milligrams a day, which usually requires taking a small supplement since it is difficult to get that much iron through diet alone. The RDA for women who breast-feed and are not menstruating is 9 milligrams a day; for adolescents who breast-feed, it is 10 milligrams daily. Oral contraceptives reduce menstrual blood losses, so women taking them need less daily iron. Post-menopausal women who are on hormone replacement therapy should consume more iron because the therapy often causes periodic uterine bleeding. Because the absorption of iron from plant foods is low compared to that from animal foods, vegetarians need to consume twice as much iron to meet their daily requirement.

The new upper intake limit (UL) for iron is set at 45 milligrams a day for adults, above which gastrointestinal distress may occur, especially when consuming iron supplements on an empty stomach. Research has suggested a possible link between elevated iron stores and a higher incidence of heart disease and cancer. However, the report says that evidence for a relationship between dietary iron intake and increased risk of these diseases is inconclusive. In addition, individuals who inherit both genes for hereditary hemochromatosis, an iron absorption disorder, are at increased risk for accumulating harmful amounts of iron. The tolerable upper intake level was not set to protect these people since there is insufficient evidence to determine a specific maximum level that would provide significant protection against the development of the clinical symptoms of this disorder. (NAS, 2002).

References:

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Lead

Lead is a naturally occurring bluish-gray metal found in small amounts in the earth's crust. Lead can be found in all parts of our environment. Much of it comes from human activities including burning fossil fuels, mining, and manufacturing. Lead has many different uses. It is used in the production of batteries, ammunition, metal products (solder and pipes), and devices to shield X-rays (ATSDR, 1999).

Sources of lead in dust and soil include lead that is deposited on the ground from air releases, mining deposits placed directly on the soil or used as fill, releases from battery cracking, metal working and other industries that process lead, and weathering and chipping of lead-based paint from buildings and other structures. Lead in dust may also come from windblown soil. Once lead falls is deposited on soil, it usually binds to soil particles. Small amounts of lead may enter rivers, lakes, and streams when soil particles are moved by rainwater. Lead may remain bound to soil particles in water for many years. Movement of lead from soil particles into underground water or drinking water is unlikely unless the water is acidic or "soft." Movement of lead from soil will also depend on the type of lead salt or compound and on the physical and chemical characteristics of the soil (ATSDR, 1999).

Sources of lead in surface water or sediment include deposits of lead-containing dust from the atmosphere, waste water from industries that handle lead (primarily iron and steel industries, lead producers and secondary smelters), urban runoff, and mining piles (ATSDR, 1999).

The levels of lead may build up in plants and animals from areas where air, water, or soil are contaminated with lead. If animals ingest contaminated plants or animals, most of the lead that they ingest will pass through their bodies in time(ATSDR, 1999).

The major pathway by which lead enters the body is by incidental ingestion of soil dust. Lead is also ingested during the chewing or mouthing of products containing lead, such as crayons, paint and other products, or from releases from pottery with lead glaze or from lead crystal into foods. Small amounts of lead enter the body by breathing in dust or chemicals that contain lead. Most of the lead that is breathed in is exhaled or swallowed. Shortly after lead gets into the body, it is quickly distributed through the blood to the "soft tissues" (such as the liver, kidneys, lungs, brain, spleen, muscles, and heart). After several weeks, most of the lead moves into the bones and teeth. In adults, about 94% of the total amount of lead in the body is contained in the bones and teeth. About 73% of the lead in children's bodies is stored in their bones. Some of the lead can stay in the bones for decades. Once it is taken in and distributed to the organs, the lead that is not stored in the bones leaves the body in the urine or feces. About 99% of the amount of lead taken into the body of an adult will leave in the waste in about 30 days, but only about 32% of the lead taken into the body of a child will leave in the waste (ATSDR, 1999).

The effects of lead are the same whether it enters the body through breathing or ingestion. The main target for lead toxicity is the central nervous system, and children are of primary concern because their nervous system is developing and the mouthing habits of small children result in increased ingestion of soil and dust. Long-term exposure of adults to lead at work has resulted in decreased performance in some tests that measure functions of the nervous system. Lead exposure may also cause weakness in fingers, wrists, or ankles. Studies in workers have suggested that lead exposure may increase blood pressure and cause kidney damage, but the evidence is inconclusive. Lead exposure may also cause anemia, a low number of blood cells. The connection between the occurrence of some of these effects (e.g., increased blood pressure, altered function of the nervous system) and low levels of exposure to lead is not certain. At high levels of exposure, lead can severely damage the brain and kidneys in adults or children. In pregnant women, high levels of exposure to lead may cause miscarriage. High-level exposure in men can damage the organs responsible for sperm production (ATSDR, 1999).

Although lead toxicity has been well studied, toxic effects from chronic low-level exposure are subtle and normally cannot be detected in children and adults. Hence, establishing a clear toxicity threshold has proven difficult. However, there are no known beneficial effects of lead in the body. The adverse effects of lead on the central nervous system and intellectual potential in young children are long-lasting and may be permanent. For investigating childhood lead exposure, the U.S. EPA Integrated Exposure Uptake Biokinetic (IEUBK) Model for Lead in Children provides a method for predicting blood levels in children under the age of six associated with site-related data (EPA, 1994a). For investigating adult lead exposures (non-residential), screening levels can be developed using the Adult Lead Methodology (EPA, 1996) and blood lead data on U.S. adult females from the combined phases of the Third National Health and Nutrition Evaluation Survey (EPA, 2002). The blood lead levels are used as an indication of risk, where risk is defined as the percent probability of exceeding the blood level of concern (i.e., 10 μg/dL).

There is no evidence that lead causes cancer in humans. Kidney tumors have developed in rats and mice given large doses of lead. The animal studies have been criticized because of the very high doses used, among other things. The results of high-dose studies may not be appropriate for predicting whether lead may cause cancer in humans. The Department of Health and Human Services (DHHS) has determined that lead acetate and lead phosphate may reasonably be expected to be capable of causing cancer, based on sufficient evidence from animal studies, but there is inadequate evidence from human studies (ATSDR, 1999). EPA considers lead to be a Group B2, probable human carcinogen. (IRIS, on-line)

CDC considers children to have an elevated level of lead if the amount of lead in the blood is at least 10 μg/dL. (ATSDR, 1999) EPA guidance sets the soil screening level for lead in soil in residential areas at 400 ppm based on this target blood lead level, and EPA policy seeks to limit the likelihood that a child will have a blood lead levels of 10 μg/dL or greater to 5%. (EPA,1994b; EPA, 1998) EPA adult lead guidance seeks to limit the likelihood that the fetus of a female worker who develops a lead body burden as a result of work exposure will have a blood lead level of 10 μg/dL or greater to 5%. (EPA, 1996)

EPA has set an Action Level of 0.015 mg/L (0.015 ppm or 15 ppb) for lead in 10 percent or more of tap water samples in a public drinking water supply, based on health effects in children and adults. For infants and children, exposure to high levels of lead in drinking water can result in delays in physical or mental development. For adults, it can result in kidney problems or high blood pressure. EPA estimates that 10 to 20 percent of human exposure to lead may come from lead in drinking water. Infants who consume mostly mixed formula can receive 40 to 60 percent of their exposure to lead from drinking water. (OGWDW, on-line)

EPA has set a national ambient air quality standard (NAAQS) for lead at 1.5 micrograms per cubic meter (1.5 $\mu g/m^3$) averaged over 3 months. The NAAQS was set on the basis of evidence that numerous health effects are associated with lead exposure, including impairment of heme synthesis, and in recognition that young children (age 1-5 years) are a particularly sensitive group to lead effects. (EPA, 1978; EPA, 1990)

OSHA regulations limit the concentration of lead in workroom air to 50 $\mu g/m^3$ for an 8-hour workday. If a worker has a blood lead level of 50 $\mu g/dL$, then OSHA requires that the worker be removed from the workroom where lead exposure is occurring. (NIOSH, 1997)

FDA includes lead on its list of poisonous and deleterious substances. FDA considers foods packaged in cans containing lead solders to be adulterated. Tin-coated lead foil has been used as a covering applied over the cork and neck areas of wine bottles for decorative purposes and to prevent insect infestations. Because it can be reasonably expected that lead could become a component of the wine, the use of these capsules is also a violation of the Federal Food, Drug, and Cosmetic Act. FDA has reviewed several direct human food ingredients and has determined them to be "generally recognized as safe" when used in accordance with current good manufacturing practices. Some of these ingredients contain allowable lead concentrations that range from 0.1 to 10 parts per million (ppm) (ATSDR, 1999)

References

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Manganese

Manganese is a naturally occurring metal that is a component of over 100 minerals. Of the heavy metals, it is surpassed in abundance only by iron. Pure manganese is silver-colored, but does not occur naturally. It combines with other substances such as oxygen, sulfur, or chlorine. Because of the natural release of manganese into the environment by the weathering of manganese-rich rosks and sediments, manganese occurs ubiquitously at low levels in soil, water, air and food. Common organic manganese compounds include pesticides, such as maneb or mancozeb, and methylcyclopentadienyl manganese tricarbonyl (MMT), a fuel additive in some gasolines (ATSDR, 2001).

Manganese is an essential nutrient, and is involved in bone formation and in protein, fat, and carbohydrate metabolism. Ingestion a small amount from food or water is needed to stay healthy. Manganese deficiency is rare, although rashes have been observed with inadequate intake. The NAS has not set a Recommended Dietary Allowance (RDA) for manganese, and Adequate Intake (AI) is currently used as the goal for intake. The AI is 1.8 mg/day for women and 2.3 mg/day for men. High intakes can result in high circulating manganese levels, which have been associated with neurotoxicity. The recommended upper intake limit (UL) for adults is 11 mg/day, based on a recent study showing that no adverse health effects occurred when this amount was consumed on a chronic basis. (NAS, 2002)

Most animal studies regarding oral exposure to manganese (manganese ingestion) have indicated there are no adverse health effects. No adverse health effects were seen in mice given 810 mg/kg-day during a chronic feeding study. There are no studies available regarding the health effects in humans or laboratory animals following dermal exposure to manganese (ATSDR, 2000).

Inhalation of excess manganese may occur from breathing manganese present in small dust-like particles in the air, particularly where manganese is used in manufacturing; this can lead to an inflammatory response in the lungs. This reaction has been observed in both man and laboratory animals and is not unique to manganese. It is, instead, characteristic of nearly all inhalable dust. There is conclusive evidence in humans, however, indicating that inhaling high levels of manganese can result in a disabling neurological syndrome that is accompanied by apathy, general weakness, dullness, anorexia, and muscle pain. Impotence and loss of libido are common signs in male workers exposed to relatively high levels of manganese in the air.(ATSDR, 2000)

EPA has classified manganese as a Group D Carcinogen (Not Classifiable as to Human Carcinogenicity), because existing studies are inadequate to assess the carcinogenicity of manganese. The cancer toxicity information was last reviewed on 12/01/1996. (IRIS, on-line)

The Reference Dose for Chronic Oral Exposure (RfD) of 1.4 $x10^{-1}$ mg/kg-day is based on a no-observed-adverse-effects level (NOAEL) of 0.14 mg/kg-day and CNS effects, including impairment of neuro-behavioral function, from human chronic ingestion data; the confidence in the oral RfD is Medium. The Oral RfD was last revised on 05/01/1996. (IRIS, on-line)

The Reference Concentration for Chronic Inhalation Exposure (RfC) of 5 $x10^{-5}$ mg/m^3 is based on a lowest-observed-adverse-effects level (LOAEL) of 0.05 mg/m^3 and impairment of neuro-behavioral function in workers exposed to manganese dioxide; the confidence in the oral RfD is Medium. The Inhalation RfD was last revised on 12/01/1993. (IRIS, on-line)

The ATSDR Minimal Risk Level (MRL) for chronic inhalation of manganese of 0.00004 mg/m^3 is based on neurological effects. (ATSDR, 2002)

References

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IRIS (EPA Integrated Risk Information System), on-line.

NAS (National Academies of Science), *Dietary Reference Intakes for Vitamin A, Vitamin K, Arsenic, Boron, Chromium, Copper, Iodine, Iron, Manganese, Molybdenum, Nickel, Silicon, Vanadium, and Zinc*, 2002.

Mercury

Mercury occurs naturally in the environment and exists in several forms. These forms can be organized under three headings: metallic mercury (also known as elemental mercury), inorganic mercury, and organic mercury. Metallic mercury is a shiny, silver-white metal that is a liquid at room temperature. Metallic mercury is the elemental or pure form of mercury (i.e., it is not combined with other elements). Metallic mercury metal is the familiar liquid metal used in thermometers and some electrical switches. At room temperature, some of the metallic mercury will evaporate and form mercury vapors. Mercury vapors are colorless and odorless. The higher the temperature, the more vapors will be released from liquid metallic mercury. (ATSDR, 1999)

Mercury combines with other elements, such as chlorine, sulfur, or oxygen, to form inorganic mercury compounds or "salts," which are usually white powders or crystals. Mercury also combines with carbon to make organic mercury compounds. (ATSDR, 1999)

Several forms of mercury occur naturally in the environment. The most common natural forms of mercury found in the environment are metallic mercury, mercuric sulfide (cinnabar ore), mercuric chloride, and methylmercury. Some microorganisms (bacteria and fungi) and natural processes can change the mercury in the environment from one form to another. The most common organic mercury compound that microorganisms and natural processes generate from other forms is methylmercury, which is of particular concern because it can build up in certain edible freshwater and saltwater fish and marine mammals to levels that are many times greater than levels in the surrounding water. (ATSDR, 1999)

The levels of mercury in the atmosphere are very, very low and do not pose a health risk; however, the steady release of mercury has resulted in current levels that are three to six times higher than the estimated levels in the pre-industrial era atmosphere. (ATSDR, 1999)

Inorganic mercury may enter water or soil from the weathering of rocks that contain mercury, from factories or water treatment facilities that release water contaminated with mercury, from the combustion of fossil fuels, from municipal landfills, and from incineration of municipal garbage that contains mercury. Inorganic or organic compounds of mercury may be released to the water or soil if mercury-containing fungicides are used. (ATSDR, 1999)

Mercury can enter and accumulate in the food chain. The form of mercury that accumulates in the food chain is methylmercury. Inorganic mercury does not accumulate up the food chain to any extent. When small fish eat the methylmercury in food, it goes into their tissues. When larger fish eat smaller fish or other organisms that contain methylmercury, most of the methylmercury originally present in the small fish will then be stored in the bodies of the larger fish. As a result, the larger and older fish living in contaminated waters build up the highest amounts of methylmercury in their bodies. (ATSDR, 1999)

Plants (such as corn, wheat, and peas) have very low levels of mercury, even if grown in soils containing mercury at significantly higher than background levels. Mushrooms, however, can accumulate high levels if grown in contaminated soils.

Because mercury occurs naturally in the environment, everyone is exposed to very low levels of mercury in air, water, and food. Between 10 and 20 nanograms of mercury per cubic meter (ng/m3) of air have been measured in urban outdoor air. These levels are hundreds of times lower than levels still considered to be "safe" to breathe. Background levels in nonurban settings are even lower, generally about 6 ng/m3 or less. Mercury levels in surface water are generally less than 5 parts of mercury per trillion parts of water (5 ppt, or 5 ng per liter of water), about a thousand times lower than "safe" drinking water standards. Normal soil levels range from 20 to 625 parts of mercury per billion parts of soil (20-625 ppb). (ATSDR, 1999)

Very small amounts of metallic mercury (for example, a few drops in an enclosed space) can raise air concentrations of mercury to levels that may be harmful to health. The longer people breathe the contaminated air, the greater the risk to their health.

It is possible to be exposed to metallic mercury vapors from breathing contaminated air around hazardous waste sites, waste incinerators, or power plants that burn mercury-containing fuels (such as coal or other fossil fuels), but most outdoor air is not likely to contain levels that would be harmful. Exposure to mercury compounds at hazardous waste sites is much more likely to occur from handling contaminated soil, drinking well-water, or eating fish from contaminated waters near those sites. Not all hazardous sites contain mercury, and not all waste sites that do contain mercury have releases of mercury to the air, water, or surface soils. (ATSDR, 1999)

A person can be exposed to mercury from breathing contaminated air, from ingesting contaminated water or food, or from direct skin contact with mercury. Not all forms of mercury easily enter your body, even if they come in contact with it. When small amounts of metallic mercury are swallowed, for example, from a broken oral thermometer, virtually none (less than 0.01%) of the mercury enters the body through the stomach or intestines, unless they are diseased. Even when a larger amount of metal mercury (a half of a tablespoon, about 204 grams) was swallowed by one person, very little entered the body. (ATSDR, 1999)

When inorganic mercury compounds are swallowed, generally less than 10% is absorbed through the intestinal tract; however, up to 40% may enter the body through the stomach and intestines in some cases. Some inorganic mercury can enter the body through the skin, but only a small amount will pass through the skin compared to the amount that gets into the body from swallowing inorganic mercury. (ATSDR, 1999)

When mercury vapors are inhaled, however, most (about 80%) of the mercury enters the bloodstream directly from the lungs, and then rapidly goes to other parts of the body, including the brain and kidneys. Once in the body, metallic mercury can stay for weeks or months. Most of the metallic mercury will accumulate in the kidneys, but some can also accumulate in the brain. When metallic mercury enters the brain, it is readily converted to an inorganic form and remains bound in the brain for a long time. Metallic mercury in the blood of a pregnant woman can enter her developing child. Most of the metallic mercury absorbed into the body eventually leaves in the urine and feces, while smaller amounts leave the body in the exhaled breath. (ATSDR, 1999)

The nervous system is very sensitive to all forms of mercury. Methylmercury and metallic mercury vapors are more harmful than other forms, because more mercury in these forms reaches the brain. Exposure to high levels of metallic, inorganic, or organic mercury can permanently damage the brain, kidneys, and developing fetus. Effects on brain functioning may result in irritability, shyness, tremors, changes in vision or hearing, and memory problems. (ATSDR, 1999)

The kidneys are also sensitive to the effects of mercury, because mercury accumulates in the kidneys and causes higher exposures to these tissues, and thus more damage. All forms of mercury can cause kidney damage if large enough amounts enter the body. If the damage caused by the mercury is not too great, the kidneys are likely to recover once the body clears itself of the contamination. In addition to effects on the kidneys, inorganic mercury can damage the stomach and intestines, producing symptoms of nausea, diarrhea, or severe ulcers if swallowed in large amounts. Effects on the heart have also been observed in children after they accidentally swallowed mercuric chloride. Symptoms included rapid heart rate and increased blood pressure. (ATSDR, 1999)

Short-term exposure (hours) to high levels of metallic mercury vapor in the air can damage the lining of the mouth and irritate the lungs and airways, causing tightness of the breath, a burning sensation in the lungs, and coughing. Other effects include nausea, vomiting, diarrhea, increases in blood pressure or heart rate, skin rashes, and eye irritation. Damage to the lining of the mouth and lungs can also occur from exposure to lower levels of mercury vapor over longer periods (for example, in some occupations where workers are exposed to mercury for many years). (ATSDR, 1999)

There is little information on the effects in humans from long-term, low-level exposure to inorganic mercury. Since the high doses fed to laboratory animals caused severe damage to the kidneys prior to cancer, these animal studies provide only limited information about whether mercury causes cancer in humans. As a result, the Department of Health and Human Services (DHHS) and the International Agency for Research on Cancer (IARC) have not classified mercury as to its human carcinogenicity. The Environmental Protection Agency has determined that mercury chloride and methylmercury are possible human carcinogens. (ATSDR, 1999)

EPA has determined that a daily exposure (for an adult of average weight) to inorganic mercury in drinking water at a level up to 2 parts per billion (ppb) is not likely to cause any significant adverse health effects. EPA has set a Maximum Contaminant Level (MCL) of 2 ppb in public drinking water supplies, because EPA believes that, given present technology and resources, this is the lowest level to which systems can reasonably be required to remove this contaminant should it occur in drinking water. (OGWDW, online) EPA is in the process of revising the Water Quality Criteria for mercury. EPA currently recommends that the level of inorganic mercury in rivers, lakes, and streams be no more than 144 parts mercury per trillion (ppt) parts of water to protect human health. FDA has set a maximum permissible level of 1 part of methylmercury in a million parts (ppm) of seafood products sold through interstate commerce. (ATSDR, 1999)

OSHA regulates levels of mercury in the workplace. It has set exposure limits of 0.1 mg/m3 for organic mercury and 0.05 mg/m3 for metallic mercury vapor in workplace air to protect workers during an 8-hour shift and a 40-hour work week. NIOSH recommends that the amount of metallic mercury vapor in workplace air be limited to an average level of 0.05 mg/m3 during a 10-hour work shift. (NIOSH, 1997)

EPA has classified mercuric chloride as a Group D Carcinogen (Not Classifiable as to Human Carcinogenicity), based on the absence of data in humans and limited evidence of carcinogenicity in rats and mice. Mercuric chloride showed mixed results in a number of genotoxicity assays. The cancer toxicity information was last reviewed on 06/01/1995. (IRIS, on-line)

The Reference Dose for Chronic Oral Exposure (RfD) to mercuric chloride of 3 x10-4 mg/kg-day is based on the lowest-observed-adverse-effects level (LOAEL) of 0.317 mg/kg-day and autoimmune effects in rat subchronic feeding and subcutaneous studies; the confidence in the oral RfD is High. The Oral RfD was last revised on 05/01/1995. (IRIS, on-line)

The Reference Concentration for Chronic Inhalation Exposure (RfC) of 3 x10-4 mg/m3 is based on the lowest-observed-adverse-effects level (LOAEL)(ADJ) of 0.009 mg/m3 and hand tremor, increases in memory disturbances, and slight subjective and objective evidence of autonomic dysfunction seen in human occupational inhalation studies; the confidence in the oral RfD is Medium. The Inhalation RfD was last revised on 06/01/1995. (IRIS, on-line)

The ATSDR Minimal Risk Level (MRL) for chronic inhalation of metallic mercury is 0.0002 mg/m3, to prevent neurological effects. (ATSDR, 2002)

References

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ATSDR (Agency for Toxic Substances and Disease Registry), ToxFAQs, 1999.

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IRIS (EPA Integrated Risk Information System), on-line.

NIOSH (National Institute for Occupational Safety and Health), *Pocket Guide to Chemical Hazards*, June 1997.

OGWDW (EPA Office of Ground Water and Drinking Water), Technical Fact Sheet on Mercury, on-line.

Nickel

Nickel combined with other elements occurs naturally in the earth's crust. It is found in all soil, and is also emitted from volcanos. Nickel is the 24th most abundant element. In the environment it is found in many minerals combined with oxygen, sulfur, arsenic, antimony and silicate. The principal form of nickel oxide occurs in combination with nickel sulfides in varying proportions in weathered ore. Nickel carbonate is a potential atmospheric and surface water pollutant (OGWDW, on-line). Much of the nickel found in sediment, soil, and rock is so strongly attached to dust and soil particles or embedded in minerals that it is not readily taken up by plants and animals and cannot easily affect health. (ATSDR, 1997)

Nickel in air is attached to small particles. The average nickel concentrations in cities and in the country ranged from 7 to 12 nanograms per cubic meter (ng/m3; 1 ng/m3 is equivalent to 1 billionth of a gram in a cubic meter of air). Soil usually contains between 4 and 80 parts of nickel in a million parts of soil (ppm). The highest soil concentrations (up to 9,000 ppm) are found near industries where nickel is extracted from ore. (ATSDR, 1997)

Nickel is required to maintain health in animals. A small amount of nickel is probably essential for humans, although a lack of nickel has not been found to affect the health of humans.

Nickel can enter the body when air containing nickel is inhaled, or when water containing nickel or food containing nickel is ingested. How much inhaled nickel reaches the lungs and enters the blood depends on the size of the dust particles. More nickel is absorbed from the lungs into the body when the dust particles are soluble in water. When the particles do not dissolve easily in water, the nickel may remain in the lungs for a long time. More nickel will be absorbed through the stomach and intestines if water-containing nickel is drunk rather than if food containing the same amount of nickel is eaten. After nickel enters the body, it is widely distributed to all organs, with the main portion going to the kidneys. (ATSDR. 1997)

The most common adverse health effect of nickel in humans is an allergic reaction. People can become sensitive to nickel when jewelry or other consumer products (such as clothing fasteners) containing it are in direct contact with the skin. Whole body skin irritations have been seen in sensitive individuals with long tern contact to nickel products. Less frequently, some individuals who are sensitive to nickel have asthma attacks following exposure to nickel. Lung effects, including chronic bronchitis and reduced lung function, have been observed in workers who breathed large amounts of nickel. (ATSDR, 1997)

People who are not sensitive to nickel must eat very large amounts of nickel to suffer adverse health effects. Workers who accidentally drank light-green water containing 250 ppm nickel from a contaminated drinking fountain had stomachaches and health impacts on blood chemistry (increased red blood cells) and kidneys (increased protein in the urine). This concentration of nickel is more than 100,000 times greater than the amount of nickel usually found in drinking water. A 2-year-old child died from heart failure after eating 5,700 milligrams (mg) of nickel as crystals of nickel sulfate. This dose of ingested nickel was about 50,000 times greater than the usual daily intake of a child.

Levels of nickel in the environment or at hazardous waste sites will not result in deaths of humans. (ATSDR, 1997)

The most serious effects of nickel, cancer of the lung and nasal sinus, have occurred in workers who have breathed dust containing nickel compounds while working in nickel refineries or in nickel processing plants. Lung and nasal sinus cancers occurred when the workers were exposed to more than 10 mg nickel/m3 as nickel compounds that were relatively insoluble (such as nickel subsulfide). Exposure to high levels of nickel compounds that dissolve easily in water may also result in cancer when insoluble nickel compounds are present, or when exposures to other chemicals that can cause cancer are present. The concentrations of soluble and less-soluble nickel compounds that were found to have caused cancers were 100,000 to 1 million times greater than the usual level of nickel in the air in the United States. (ATSDR, 1997)

The U.S. Department of Health and Human Services (DHHS) has determined that nickel and certain nickel compounds may reasonably be anticipated to be carcinogens. The International Agency for Research on Cancer (IARC) has determined that some nickel compounds are carcinogenic to humans and that metallic nickel may possibly be carcinogenic to humans. The EPA has determined that nickel refinery dust and nickel subsulfide are human carcinogens. (ATSDR, 1997)

Other lung effects including chronic bronchitis and reduced lung function have been observed in workers breathing nickel. Current levels of nickel in workplace air are much lower than in the past, and few workers have symptoms from nickel exposure. (ATSDR, 1997)

Oral exposure of humans to high levels of soluble nickel compounds through the environment is extremely unlikely. Therefore, because humans have only rarely been exposed to high levels of nickel in water or food, much of our knowledge of nickel toxicity is based on animal studies. Eating or drinking levels of nickel very much greater than the levels normally found in food and water have been reported to cause lung disease in dogs and rats and to affect the stomach, blood, liver, kidneys, immune system, and reproduction and development in rats and mice. (ATSDR, 1997)

When rats and mice breathed nickel compounds for a lifetime, insoluble nickel compounds caused cancer, while a soluble nickel compound did not cause cancer.

EPA remanded the Maximum Contaminant Level (MCL) for nickel in public drinking water supplies on February 9, 1995. This means that while many water suppliers continue to monitor nickel in their water, there is currently no EPA legal limit on the amount of nickel in drinking water, although EPA is currently reconsidering imposing a limit on nickel. (OGWDW, on-line) The remanded MCL for nickel is 0.1 mg/L. EPA has not found nickel to potentially cause health effects from acute exposures at levels above the MCL. Short-term exposures that are considered "safe" for a 10-kg (22 lb.) Child consuming 1 liter of water per day are 1 mg/L for a one- to ten-day exposure and 0.5 mg/L for up to 7 years of exposure. EPA states that long-term exposure to 0.02 mg nickel/kilogram (kg) of body weight/day in food or drinking water is safe for humans. This value is for nickel compounds that dissolve easily in water. Nickel has the potential to cause the following health effects from long-term exposures to drinking water above the MCL: decreased body weight, heart and liver damage, and dermatitis. (OGWDW, on-line)

The National Academies of Science has not set a Recommended Dietary Allowance (RDA) for nickel; however an upper intake limit (UL) was set at 1 mg/day due to a potential increased risk of averse effects (nausea, abdominal pain, diarrhea and vomiting, and impaired growth) from consuming too much nickel. (NAS, 2002)

Nickel levels in workplace air are regulated by OSHA, which has set an occupational exposure limit for workers of 1 mg nickel/m3 in air for an 8-hour workday, 40-hour work week. The recommended exposure limit set by NIOSH is 0.015 mg nickel/m3 for nickel metal and other compounds. (NIOSH, 1997)

EPA has not evaluated soluble salts of nickel, as a class of compounds, for potential human carcinogenicity. However, nickel refinery dust and specific nickel compounds - nickel carbonyl and nickel subsulfide - have been evaluated. Summaries of these evaluations are on IRIS. (IRIS, on-line)

The Reference Dose for Chronic Oral Exposure (RfD) of 2 x10-2 mg/kg-day for soluble nickel salts is based on a no-observed-adverse-effects level (NOAEL) of 5 mg/kg-day and decreased body and organ weights in a rat chronic oral study; the confidence in the oral RfD is Medium. The Oral RfD was last revised on 12/01/1996. (IRIS, on-line)

No Reference Concentration for Chronic Inhalation Exposure (RfC) is available at this time. (IRIS, on-line)

The ATSDR Minimal Risk Level (MRL) for chronic inhalation exposure of nickel is 0.0002 mg/m3, based on respiratory effects. (ATSDR, 2002)

References

ATSDR (Agency for Toxic Substances and Disease Registry), Toxicological Profile for Nickel, 1997.

ATSDR (Agency for Toxic Substances and Disease Registry), ToxFAQs, 1997.

ATSDR (Agency for Toxic Substances and Disease Registry), Minimal Risk Levels (MRLs) for Hazardous Substances, 2002, on-line.

IRIS (EPA Integrated Risk Information System), on-line.

NAS (National Academies of Science), Dietary Reference Intakes for Vitamin A, Vitamin K, Arsenic, Boron, Chromium, Copper, Iodine, Iron, Manganese, Molybdenum, Nickel, Silicon, Vanadium, and Zinc, 2002

NIOSH (National Institute for Occupational Safety and Health), Pocket Guide to Chemical Hazards, June 1997.

OGWDW (EPA Office of Ground Water & Drinking Water), on-line at www.epa.gov/safewater/

Polynuclear Aromatic Hydrocarbons (PAH's)

PAH's are a group of chemicals that are formed during the incomplete burning of coal, oil, gas, wood, garbage, or other organic substances, such as tobacco and charbroiled meat. There are more than 100 different PAH's. PAH's generally occur as complex mixtures (for example, as part of combustion products such as soot), not as single compounds. PAH's usually occur naturally, but they can be manufactured as individual compounds for research purposes; however, not as the mixtures found in combustion products. As pure chemicals, PAH's generally exist as colorless, white, or pale yellow-green solids. They can have a faint, pleasant odor. A few PAH's are used in medicines and to make dyes, plastics, and pesticides (ASTDR 1995).

Although the health effects of individual PAH's are not exactly alike, the following 17 PAH's are considered as a group in this profile:

- acenaphthene
- acenaphthylene
- anthracene
- benz[a]anthracene
- benzo[a]pyrene
- benzo[e]pyrene
- benzo[b]fluoranthene
- benzo[g,h,i]perylene
- benzo[j]fluoranthene
- benzo[k]fluoranthene
- chrysene
- dibenz[a,h]anthracene
- fluoranthene
- fluorene
- indeno[1,2,3-c,d]pyrene
- phenanthrene
- pyrene

These 17 PAH's were chosen to be included in this profile because (1) more information is available on these than on the others; (2) they are suspected to be more harmful than some of the others, and they exhibit harmful effects that are representative of the PAH's; (3) there is a greater chance that you will be exposed to these PAH's than to the others; and (4) of all the PAH's analyzed, these were the PAH's identified at the highest concentrations at NPL hazardous waste sites (ASTDR 1995).

PAH's enter the environment mostly as releases to air from volcanoes, forest fires, residential wood burning, and exhaust from automobiles and trucks. They can also enter surface water through discharges from industrial plants and waste water treatment plants, and they can be released to soils at hazardous waste sites if they escape from storage containers. The movement of PAH's in the environment depends on properties such as how easily they dissolve in water, and how easily they evaporate into the air. PAH's in general do not easily dissolve in water. In soils, PAH's are most likely to stick tightly to particles. Some PAH's evaporate from surface soils to air. Certain PAH's in soils also contaminate underground water. The PAH content of plants and animals living on the land or in water can be many times higher than the content of PAH's in soil or water (ASTDR 1995).

PAH's can break down to more stable products by reacting with sunlight and other chemicals in the air, generally over a period of days to weeks. Breakdown in soil and water generally takes weeks to months and is caused primarily by the actions of microorganisms (ASTDR 1995).

Background levels of some representative PAH's in the air are reported to be 0.02-1.2 nanograms per cubic meter (ng/m^3) in rural areas and 0.15-19.3 ng/m^3 in urban areas. PAH's have been found in some drinking water supplies in the United States. Background levels of PAH's in drinking water range from 4 to 24 nanograms per liter (ng/L). (ASTDR 1995) The level of PAH's in the typical U.S. diet is less than 2 parts of total PAH's per billion parts of food (ppb), or less than 2 micrograms per kilogram of food (μg/kg). (ASTDR 1995).

PAH's can enter the body through the lungs when air that contains them (usually attached to particles or dust) are inhaled. Cigarette smoke, wood smoke, coal smoke, and smoke from many industrial sites may contain PAH's. It is not known how rapidly or completely the lungs absorb PAH's. Ingestion of drinking water and food, soil, or dust particles that contain PAH's are other routes for these chemicals to enter the body, but absorption is generally slow when PAH's are ingested. The rate at which PAH's are absorbed into the body by ingestion or through the skin can be influenced by the presence of other compounds that one is exposed to at the same time with PAH's (ASTDR 1995).

PAH's can enter all body tissues that contain fat, but they tend to be stored mostly in the kidneys, liver, and fat. Smaller amounts are stored in the spleen, adrenal glands, and ovaries. PAH's are metabolized by all tissues in the body into many different substances, some of which are more toxicl and some are less toxic than the original PAH's (ASTDR 1995). Results from animal studies show that PAH's do not remain the body for very time. Most PAH's that enter the body are excreted within a few days, primarily in the feces and urine (ASTDR 1995).

Several of the PAH's, including benz[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[j]fluoranthene, benzo[k]fluoranthene, chrysene, dibenz[a,h]anthracene, and indeno [1,2,3-c,d]pyrene, have been shown to cause tumors in laboratory animals when they were exposed by inhalation (lung cancer), ingestion in diet (stomach cancer), or had them applied to their skin (skin cancer). Studies show that individuals exposed by breathing or by prolonged skin contact to mixtures that contain PAH's and other compounds can also develop cancer (ASTDR 1995).

Mice fed high levels of one PAH during pregnancy had difficulty reproducing and so did their offspring. These offspring also had higher rates of birth defects and lower body weights. It is not known whether these effects occur in humans. Animal studies have also shown that PAH's can cause adverse effects on the skin, body fluids, and ability to fight disease after both short- and long-term exposure. But these effects have not been seen in humans. (ATSDR 1996).

The Department of Health and Human Services (DHHS) has determined that benz[a]anthracene, benzo[b]fluoranthene, benzo[j]fluoranthene, benzo[k]fluoranthene, benzo[a]pyrene, dibenz[a,h]anthracene, and indeno[1,2,3-c,d]pyrene are known animal carcinogens. The International Agency for Research on Cancer (IARC) has determined the following: benz[a]anthracene and benzo[a]pyrene are probably carcinogenic to humans; benzo[b]fluoranthene, benzo[j]fluoranthene, benzo[k]fluoranthene, and indeno[1,2,3-c,d]pyrene are possibly carcinogenic to humans; and anthracene, benzo[g,h,i]perylene, benzo[e]pyrene, chrysene, fluoranthene, fluorene, phenanthrene, and pyrene are not classifiable as to their carcinogenicity in humans. EPA has determined that benz[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, chrysene, dibenz[a,h]anthracene, and indeno[1,2,3-c,d]pyrene are probable human carcinogens and that acenaphthylene, anthracene, benzo[g,h,i]perylene, fluoranthene, fluorene, phenanthrene, and pyrene are not classifiable as to human carcinogenicity. Acenaphthene has not been classified for carcinogenic effects by the DHHS, IARC, or EPA (ASTDR 1995).

The federal government has set regulations to protect the public from the possible health effects of eating, drinking, or breathing PAH's. EPA has suggested that a daily ingestion/inhalation of the following amounts of individual PAH's is not likely to cause any harmful health effects: 0.3 milligrams (mg) of anthracene, 0.06 mg of acenaphthene, 0.04 mg of fluoranthene, 0.04 mg of fluorene, and 0.03 mg of pyrene per kilogram (kg) of body weight. Actual exposure for most of the U.S. population occurs from active or passive inhalation of these compounds in tobacco smoke, wood smoke, and contaminated air, and from ingestion of the compounds in foods. Skin contact with contaminated water, soot, tar, and soil may also occur. Estimates for total exposure in the U.S. population have been listed as 3 mg/day (ASTDR 1995).

EPA has set a Maximum Contaminant Limit (MCL) of 2 ppb (2 μg/L) for benzo(a)pyrene in public drinking water supplies to prevent adverse health effects in people consuming contaminated drinking water, because EPA believes, given present technology and resources, this is the lowest level to which water systems can reasonably be required to remove this contaminant should it occur in drinking water. The short-term health effects of concern when drinking water above the MCL is ingested include red blood cell damage leading to anemia and suppression of the immune system. Adverse effects from lifetime exposure to drinking water above the MCL include developmental and reproductive effects and cancer. (OGWDW, on-line)

EPA has provided estimates of levels of total cancer-causing PAH's in lakes and streams associated with a risk of human cancer development. If the following amounts of individual PAH's are released to the environment within a 24-hour period, EPA must be notified: 1 pound of benzo[b]fluoranthene, benzo[a]pyrene, or dibenz[a,h]anthracene; 10 pounds of benz[a]anthracene; 100 pounds of acenaphthene, chrysene, fluoranthene, or indeno[1,2,3-c,d]pyrene; or 5,000 pounds of acenaphthylene, anthracene, benzo[k]fluoranthene, benzo[g,h,i]perylene, fluorene, phenanthrene, or pyrene (ASTDR 1995).

The Occupational Safety and Health Administration (OSHA) has set an worker exposure limit of 0.2 milligrams of PAH's per cubic meter of air (0.2 mg/m^3) for coal tar pitch volatiles (which includes anthracene, benzo(a)pyrene, phenanthrene, acridine, chrysene, pyrene, etc.) in workplace air for an 8-hour workday, 40-hour work week. The OSHA Permissible Exposure Limit (PEL) for mineral oil mist that contains PAH's is 5 mg/m^3 averaged over an 8-hour exposure period. The National Institute for Occupational Safety and Health (NIOSH) recommends that the average workplace air levels for coal tar products not exceed 0.1 mg/m^3 for a 10-hour workday, within a 40-hour work week. There are other limits for workplace exposure for substances that contain PAH's, such as coal, coal tar, and mineral oil (NIOSH, 1997).

The American Conference of Governmental Industrial Hygienists (ACGIH) recommends an occupational exposure limit for coal tar products of 0.2 mg/m^3 for an 8-hour workday, within a 40-hour workweek (ASTDR 1995).

Benzo(a)pyrene (BAP)is classified as a Group B carcinogen (Probable Human Carcinogen) based on sufficient evidence of carcinogenicity in animals. Human data specifically linking BAP to a carcinogenic effect are lacking. BAP is also considered highly likely to be carcinogenic by the dermal route based on results from animal studies. The Carcinogenicity Assessment was last revised on 11/01/1994. (IRIS, on-line)

The Oral Slope Factor for BAP is 7.3 per mg/kg-day, based on a geometric mean of four slope factors obtained by different modeling procedures, and data from CFW mice, SWR/J Swill mice, and Sprague-Dawley rats (males and females) exposed orally in their diet. Tumor types included forestomach, squamous cell papillomas and carcinomas; forestomach, larynx and esophagus, papillomas and carcinomas (combined). (IRIS, on-line)

The Drinking Water Unit Risk is 2.1×10^{-1} per mg/L. (IRIS, on-line)

Separate Oral Slope Factors have not been developed for PAHs other than BAP. Toxicity Equivalency Factors (TEFs), which are based on the relative cancer potency of an individual PAH with respect to benzo(a)pyrene, have been developed and are used to assess toxicity to benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, and other PAHs listed in this discussion. (EPA, 1993)

References

ATSDR (Agency for Toxic Substances and Disease Registry), *Toxicological Profile for PAH's*, 1995.

ATSDR (Agency for Toxic Substances and Disease Registry), ToxFAQs, 1996.

EPA (U.S. Environmental Protection Agency), *Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons*, EPA/540/R-94/013, March 1993.

IRIS (EPA Integrated Risk Information System), on-line.

NIOSH (National Institute for Occupational Safety and Health), *Pocket Guide to Chemical Hazards*, June 1997.

OGWDW (EPA Office of Ground Water & Drinking Water), on-line at http://www.epa.gov/safewater/hfacts.html

Sodium

Sodium is the sixth most abundant element on earth and is widely distributed in soil, plants, water and foods. Most of the world has significant deposits of sodium-containing minerals, and sodium is ubiquitous in water because of the high solubility of many sodium salts. Groundwater typically contains higher concentrations of minerals and salts than does surface water. Sodium is present in road deicing products, in water treatment chemicals, in domestic water softeners and in sewage effluents. The many uses contribute significant quantities of sodium to water. (EPA, 2002)

Sodium is an essential nutrient, and adequate levels of sodium are required for good health. Food is the main source of sodium for humans, primarily in the form of salt. Studies have reported dietary intakes of sodium ranging from 1,800 to 5,000 milligrams per day (mg/day), while the Food and Drug Administration has found that most adult Americans tend to consume between 4,000 and 6,000 mg of sodium per day. (EPA, 2002). Virtually all (~99%) of the sodium ingested in food and water is absorbed from the gastrointestinal tract, and is rapidly distributed throughout the body. Sodium is excreted mainly excreted in urine, although some loss occurs in fecal matter and in perspiration.

The estimated minimum daily requirement for healthy adults and children 10 years and older is 500 mg/day (NRC, 1989), with requirements at birth ranging from 100 to 200 mg/day and increasing throughout childhood to 400 mg/day at 9 years of age. Minimum requirements increase during pregnancy and lactation. Minimum levels are easily supplied by the average American diet. (NRC, 1989). The NAS and the NRC Dietary Guidelines for Americans recommend an upper level of 2,400 mg sodium per day as a prudent and achievable limit to prevent the risk for hypertension; this is also the FDA recommended Daily Value for sodium. (NRC, 1989, EPA, 1996)

Ingestion of sodium is not believed to cause cancer. Very high consumption of sodium chloride (salt) may cause nausea, vomiting, inflamation of the gastrointestinal tract, thirst, muscular twitching, convulsions and possibly death. For long-term ingestion of lower concentrations of sodium, the primary health concern is increased blood pressure (hypertension). There is a large body of evidence that suggests that excessive sodium intake contributes to age-related increases in blood pressure leading to hypertension. (EPA, 2002) Populations that are expected to have an increased sensitivity to sodium include individuals with hypertension, the elderly, African-Americans, and individuals with kidney problems. (EPA, 2002) Sodium has long been a major dietary factor in reducing the risk of, and controlling, high blood pressure. This was reiterated as recently as January 1993 in the fifth report of the Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure. The committee noted that numerous studies have shown that reducing sodium intake can reduce blood pressure. (FDA, 1993)

The EPA Office of Water has issued a Drinking Water Advisory to provide guidance to communities that may be exposed to drinking water containing sodium chloride or other sodium salts. This advisory recommends that sodium concentrations in drinking water not exceed a range of 30 and 60 mg/L. This range is based on esthetic effects (i.e., taste), and contributes 2.5 - 5.0 percent of the daily dietary goal of 2,400 mg/day, if tap water consumption is 2 liters/day. At the present time, the US EPA guidance level for sodium in drinking water is 20 mg/L developed for those individuals restricted to a sodium diet of 500 mg/day. EPA requires Public Water Systems that exceed 20 mg/L to notify local and State public health officials. (EPA, 1996)

References

EPA Code of Federal Regulations, Parts 126-149, Section 141.41, Office of the Federal Register, pp 352-353, 1996.

EPA (Environmental Protection Agency), Drinking Water Advisory: Consumer Acceptability Advice and Heath Effects Analysis on Sodium, EPA 822-R-02-032, April 2002.

FDA (U.S. Food and Drug Administration), Fifth Report of the Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure, January 1993.

FDA (U.S. Food and Drug Administration), *Scouting for Sodium and Other Nutrients Important to Blood Pressure*, Publication Number FDA 95-2284, 1995.

NRC (National Research Council), Committee on Diet and Health Food Nutrition Board, Commission on Life Sciences,, Diet and health: Implications for reducing chronic disease risk, pp. 413-430, 1989.

USDA (US Department of Agriculture), *Nutrition and Your Health: Dietary Guidelines for Americans*, 5th ed. Home and Garden Bulletin No. 232, 2000.

Thallium

Pure thallium is a bluish-white metal that is found in trace amounts in the earth's crust. In the past, thallium was obtained as a by-product from smelting other metals; however, it has not been produced in the United States since 1984. Currently, all the thallium is obtained from imports and from thallium reserves. Thallium is used mostly in manufacturing electronic devices, switches, and closures, primarily for the semiconductor industry. It also has limited use in the manufacture of special glass and for certain medical procedures (ATSDR, 1995).

Thallim can effect the nervous system, lungs, liver, and kidneys if large amounts are ingested over short periods of time. Effects include temporary hair loss, vomiting, and diarrhea. Death may result if very large amounts are ingested over a short period of time (acute exposure). Chronic effects have not been determined (ATSDR, 1995). Animal reproductive organs, especially the testes, are damaged after drinking small amounts of thallium-contaminated water for 2 months. In adult white mice, thallium (thallium sulfate) crossed the placenta and located in the fetus in 15 minutes following intraperitoneal injection (50 microCuries, specific activity not available). However, in human studies evaluating developmental toxicity, the number of congenital malformations and anomalies was not increased over the number expected (ATSDR, 1992).

Thallium forms complexes in solution with halogens, oxygen and sulfur. Increases in alopecia, lacrimation and exophthalmos were observed throughout an oral study with rats. Moderate changes were observed in blood chemistry parameters (SGOT, LDH, sodium, and sugar levels). The highest dose of thallium sulfate , 0.25 mg/kg/day, was considered the NOAEL (ASTSR, 1992).

EPA has set a Maximum Contaminant Limit (MCL) of 2 ppb (2 μg/L) for thallium in public drinking water supplies to prevent adverse health effects in people consuming contaminated drinking water. The short-term health effects of concern when drinking water above the MCL is ingested include gastrointestinal irritation and nerve damage. Adverse effects from lifetime exposure to drinking water above the MCL include changes in blood chemistry, damage to the liver, kidney, intestinal and testicular tissues, and hair loss. (OGWDW, on-line)

EPA has classified the thallium salts as Group D carcinogens (Not Classifiable as to Human Carcinogenicity), based on a lack of carcinogenicity data in animals and humans. Several subchronic and chronic animals on thallium and compounds are available; however they were not designed to evaluate carcinogenic endpoints. (IRIS, on-line)

EPA has developed a Reference Dose for Oral Chronic Exposure (RfD) of 8 x 10-5 mg/kg/day. for the salts of thallium, based on the no-observed-adverse-effects-level (NOAEL) of 0.25 mg/kg/day, in an EPA rat oral sub-chronic study. The confidence in the Oral RfD is low. Rats receiving thallium sulfate exhibited moderate dose-related changes in some blood chemistry parameters: increased SGOT, LDH, and sodium levels, and decreased blood sugar levels. The only grossly observed finding thought to be treatment-related was alopecia, especially in female rats, although microscopic evaluations did not indicate any histopathologic alterations. The toxicity values for thallium chloride and thallium sulfate were last evaluated on 09/01/1990. The Oral RfD for thallic oxide was last reviewed on 07/01/1996, and the RfD for this compound was withdrawn. The recent toxicology literature pertinent to the RfD for thallic oxide was reviewed in September 2002 and did not identify any critical new studies. (IRIS, on-line)

References

ATSDR (Agency for Toxic Substances and Disease Registry), Toxicological Profile for Thallium, 1992.

ATSDR (Agency for Toxic Substances and Disease Registry), ToxFAQs for Thallium, September 1995

IRIS (EPA Integrated Risk Information System), on-line.

OGWDW (EPA Office of Ground Water & Drinking Water), on-line at

www.epa.gov/safewater/hfacts.html

Vinyl Chloride

Vinyl chloride is a colorless gas at normal temperatures. It is also known as chloroethene, chloroethylene, ethylene monochloride, or monochloroethylene. It is flammable (burns easily) as a gas and is not stable at high temperatures. Vinyl chloride exists in liquid form if kept under high pressure or at low temperatures (less than -13.4°C). Vinyl chloride has a mild, sweet odor. Most people can smell vinyl chloride in the air at 3,000 parts vinyl chloride per million parts (ppm) of air. However, the odor is of no value in preventing excess exposure. Most people can taste vinyl chloride in water at 3.4 ppm. (ATSDR, 1997)

Most drinking water supplies do not contain vinyl chloride. In a 1982 survey, vinyl chloride was found in less than 1% of the 945 groundwater supplies tested in the United States. The concentrations found in groundwater were up to 0.008 ppm, with a detection limit of 0.001 ppm. Other studies have reported groundwater vinyl chloride concentrations at or below 0.38 ppm. At one time, the flow of water through PVC pipes added very low amounts of vinyl chloride to water. For example, in one study of newly installed pipes, the drinking water had 0.001 ppm of vinyl chloride. No current information on the amount of vinyl chloride released from PVC pipes into water is available. (ATSDR, 1997)

If vinyl chloride comes into contact with the skin, negligible amounts may pass through the skin and enter the body. Vinyl chloride is more likely to enter the body through inhalation or ingestion. Most of inhaled or ingested vinyl chloride enters the blood rapidly. It is metabolized in the liver, and most of the vinyl chloride is gone from the body a day after inhalation or ingestion. . The metabolites formed in the liver, however, do not leave the body as rapidly. A few of these compounds are more harmful than vinyl chloride because they can react with other chemicals in the body and interfere with the way the body normally uses or responds to these chemicals. Some of these compounds react in the liver and, may cause damage there. It takes longer for the body to eliminate these metabolites, but eventually they are excreted as well. Excess vinyl chloride will be exhaled if more vinyl chloride than the liver can break down is inhaled or ingested. The initial reaction on vinyl chloride is on the central nervous system (CNS). Within 5 minutes after exposure to about 10,000 ppm of vinyl chloride, dizziness or sleepiness will occur. Inhalation of still higher levels may cause loss of consciousness. People may die if they breathe extremely high levels of vinyl chloride. These levels are much higher than the levels that cause unconsciousness. (ATSDR, 1997)

Most of the studies on long-term exposure (365 days or longer) to vinyl chloride are on workers that make or use vinyl chloride. These workers were exposed to much higher levels of vinyl chloride in the air than the general population. Breathing vinyl chloride for long periods of time can result in changes to the structure of the livers. People who work with vinyl chloride have developed nerve damage and immune reactions. Other workers have had problems with the blood flow in their hands; the tips of their fingers turn white and hurt when they are in cold temperatures. Sometimes, the bones in the tips of their fingers have broken down. (ATSDR, 1997)

Animal studies have shown that long-term (365 days or longer) exposure to vinyl chloride can cause damage to the sperm and testes. It has not been proven that vinyl chloride causes birth defects in humans, but animal studies have shown that breathing vinyl chloride can harm unborn offspring and may also result in early miscarriages. (ATSDR, 1997)

The effects of ingestion of high levels of vinyl chloride are unknown. Vinyl chloride will cause numbness, redness, and blisters with contact to the skin.

Results from several studies have suggested that breathing air or drinking water containing low levels of vinyl chloride may increase the risk of getting cancer. However, the exposure levels in these studies were much higher than normally found in ambient air and/or most drinking water supplies. Studies of workers who have breathed vinyl chloride over many years showed increased rates of cancer of the liver. Brain cancer, lung cancer, and some cancers of the blood may also be connected with breathing vinyl chloride over long periods. Studies of long-term exposure in animals showed that increases in cancer of the liver and mammary gland may occur at very low levels of vinyl chloride in the air. Animals fed low levels of vinyl chloride daily during their lifetime had an increased rate of liver cancer. (ATSDR, 1997)

The Department of Health and Human Services (DHHS) has determined that vinyl chloride is a known carcinogen. The International Agency for Research on Cancer (IARC) has determined that vinyl chloride is carcinogenic to humans, and EPA has determined that vinyl chloride is a human carcinogen. (ATSDR, 1997)

EPA has set a Maximum Contaminant Limit (MCL) of 0.002 parts per million (0.002 mg/L or 2 μ/L) for vinyl chloride in public drinking water supplies, because EPA believes, given present technology and resources, this is the lowest level to which water systems can reasonably be required to remove this contaminant should it occur in drinking water. (OGWDW, on-line)

The EPA requires that spills or accidental releases into the environment of 1 pound or more of vinyl chloride be reported to the EPA. (OGWDW, on-line)

The Occupational Safety and Health Administration (OSHA) has set the maximum allowable level of vinyl chloride in workroom air during an 8-hour workday in a 40-hour workweek at 1 part vinyl chloride per million parts of air (1 ppm). The maximum amount allowed in any 15 minute period is 5 ppm. NIOSH recommends that the exposure limit [for a time-weighted average (TWA)] for vinyl chloride in air be the lowest reliably detectable concentration. (NIOSH, 1997)

In order to limit intake of vinyl chloride through foods to levels considered safe, the FDA regulates the vinyl chloride content of various plastics. These include plastics that carry liquids and plastics that come into contact with food. The limits for vinyl chloride content vary depending on the nature of the plastic and its use. (ATSDR, 1997)

Vinyl Chloride is classified as a known human carcinogen (Category A) by the inhalation route of exposure, based on human epidemiological data, and by analogy by the oral route because of positive animal bioassay data as well as pharmacokinetic data allowing dose extrapolation across routes. VC is also considered highly likely to be carcinogenic by the dermal route because it is well absorbed and acts systemically. The Carcinogenicity Assessment was last revised on 08/07/2000. (IRIS, on-line)

The Oral Slope Factor for continuous lifetime exposure during adulthood is 7.2 x10-1 per mg/kg-day (extrapolated using the LMS method) and for continuous lifetime exposure from birth is1.5 per mg/kg-day (extrapolated using the LED10/linear extrapolation method), based on the total of liver angiosarcoma, hepatocellular carcinoma, and neoplastic nodules in female Wistar rats given vinyl chloride in their diet. These values represent the lowest/highest of multiple discrete slope factors for this substance. (IRIS, on-line)

The Drinking Water Unit Risk for continuous lifetime exposure during adulthood is 2.1 x10-2 per mg/L. The Drinking Water Unit Risk for continuous lifetime exposure from birth is 4.2 x10-2 per mg/L . These values represent the lowest/highest of multiple discrete slope factors for this substance.

The Inhalation Unit Risk for continuous lifetime exposure during adulthood is 4.4 x10-3 per mg/m3, using both the LMS and the LED10/linear extrapolation methods. The Inhalation Unit Risk for continuous lifetime exposure from birth is 8.8 x10-3 per mg/m3, using both the LMS and the LED 10/linear extrapolation methods. These values are based on liver angiosarcomas, angiomas, hepatomas, and neoplastic nodules in female Sprague-Dawley rats exposed by inhalation. These values represent the lowest/highest of multiple discrete slope factors for this substance. (IRIS, on-line)

The Reference Dose for Chronic Oral Exposure (RfD) is 3 x10-3 mg/kg-day and is derived from the no-observed-adverse-effects-level (NOAEL) (HED) of 0.09 mg/kg, based on liver cell polymorphism in a rat chronic feeding study. The confidence in the Oral RfD is medium. The Oral RfD was last revised on 08/07/2000. (IRIS, on-line)

The Reference Concentration for Chronic Inhalation Exposure (RfC) is 1x10-1 mg/m3, and is derived from the no-observed-adverse-effects-level (NOAEL) (HEC) of 2.5 mg/m3, based on liver cell polymorphism in a rat chronic feeding study. The confidence in the Inhalation RfC is medium. The Inhalation RfC was last revised on 08/07/2000. (IRIS, on-line)

The ATSDR Minimal Risk Level for acute inhalation exposure (1-14 days) is 0.5 ppm, based on developmental effects, and 0.03 ppm for intermediate inhalation exposure (>14-364 days), based on liver effects. (ATSDR, 2002)

References

ATSDR (Agency for Toxic Substances and Disease Registry), *Toxicological Profile for Vinyl Chloride*, 1997.

ATSDR (Agency for Toxic Substances and Disease Registry), ToxFAQs, 1997.

ATSDR (Agency for Toxic Substances and Disease Registry), Minimal Risk Levels (MRLs) for Hazardous Substances, 2002, on-line.

IRIS (EPA Integrated Risk Information System), on-line.

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NIOSH (National Institute for Occupational Safety and Health), *Pocket Guide to Chemical Hazards*, June 1997.